THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

CONTENTS.—APRIL, 1915.

DEPARTMENT OF AGRICULTURE, VICTORIA

RED POLL DAIRY HERD

YOUNG BULLS FOR SALE

TO VICTORIAN DAIRYMEN

DAM.	Date of Birth.	RECORD OF DAM.				PRICE.		
		Milk lbs.	Average Test.	Fat lbs.	Butter lbs.	£	s.	d.
	Sired by "NICOTINE" by ACTON DEWSTONE (imp.)							
Pennsylvania ...	2.7.14	6340	4·0—5·2	271·9	310	13	13	0
Havana ...	17.8.14	6365	4·15	264·3	301¼	13	13	0
Kentucky ..	21.8.14	7905	3·96	313·3	357¼	15	15	0
	Sired by "BELMONT" by ACTON AJAX (imp.)							
Mongolia ...	20.9.14	Heifer.	No Record.			5	5	0
Zealana ...	15.10.14	,,	,,	,,		5	5	0
	Sired by "GANYMEDE"							
Soudana ...	20.11.14	Heifer.	No Record.			5	5	0
Ontario ...	18.12.14	,,	,,	,,		5	5	0

The prices are based approximately on the actual milk and butter fat record of the dam at the rate of 1s. per lb. of butter fat yielded.
See Journal of Agriculture, September, 1914.

Inspection by arrangement with Mr. E. STEER, Herdsman, Central Research Farm, Werribee.

Application for purchase to DIRECTOR OF AGRICULTURE, MELBOURNE.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 4. 10th April, 1915.

RESULTS OF FIELD TESTS WITH WHEAT AT EXPERIMENT FARMS.

SEASON 1914.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

The Season.

The season 1914 will long be remembered in our agricultural history as the driest season ever experienced throughout the wheat belt of Australia.

Throughout the winter and spring the rain-bringing Antarctic disturbances, which usually course from west to east across the temperate portion of the continent, have kept hundreds of miles south of their usual track, with the result that the wheat-growing areas of the Commonwealth received barely sufficient rain to germinate the seed, much less bring the struggling crops to maturity.

It was not so much the total rainfall for the year as the seasonal distribution of the rain that was responsible for the comparative failure of the crop in Victoria, South Australia, and the Riverina. Judged by the criterion of total rainfall, the season was much drier than 1902; but judged by the amount of "useful rain," *i.e.*, rainfall during the growing period of the wheat crop, the season was absolutely without precedent in the annals of the State.

The efficiency of a rain depends largely on the season of the year in which it falls, and the amount of evaporation and the soil temperature at the time of fall. An isolated fall of less than half an inch in January and February is of little use on account of the high soil temperatures and intense evaporation. A few days' warm weather, or a brisk wind, will dissipate the moisture and render the soil as dry as

ever. On the other hand, the same fall of rain in June, July, or August is of considerable value, because of the greatly lessened evaporation and low soil temperatures. A district in which the bulk of the rain falls in winter is far more effective for wheat production than one of equal rainfall where the rain falls mainly in the summer months. It is for this reason that wheat is being successfully grown in South Australia and Victoria on an annual rainfall 5 to 6 inches lower than that regarded as safe in Northern New South Wales.

Now, the extraordinary features of last season have been (1) the practical absence of winter rains, (2) the abnormal seasonal distribution of the rain, (3) uniformly heavy evaporation, and (4) the excessively hot spring.

A simple summary, showing the monthly rainfall and evaporation at three representative centres—Rutherglen, Werribee, and Wyuna—will convey more eloquently than any description the outstanding features of the season. Incidentally, too, the figures will serve to give meaning to the results of the various field tests:—

TABLE I.

SUMMARY OF RAINFALL AND EVAPORATION, SEASON 1914.

Month.	Rainfall.			Evaporation.		
	Rutherglen.	Werribee.	Wyuna.	Rutherglen.	Werribee.	Wyuna.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1. January	1·10	·89	·27	12·38	7·76	14·79
2. February	·03	·11	·05	8·92	6·59	10·19
3. March	2·00	·94	·06	7·65	5·57	7·59
4. April	1·58	1·50	·85	3·66	3·02	4·04
5. May	2·17	1·45	1·01	1·68	1·49	2·00
6. June	·60	·91	·27	1·05	·99	1·22
7. July	·88	·91	·41	1·08	·93	1·94
8. August	·45	·38	·18	1·77	2·59	2·60
9. September ..	·47	1·32	·17	3·74	3·06	4·58
10. October	Nil	·12	Nil	7·82	5·96	7·86
11. November ..	1·06	1·65	1·00	9·36	6·40	8·34
12. December	4·19	3·04	1·58	10·27	6·15	9·23
Total for year ..	14·53	13·22	5·85	69·38	50·51	74·38

TABLE II.

—	Rutherglen.	Werribee.	Wyuna.
Average annual rainfall	21·5	20·5	14·5
Rainfall in 1914	14·53	13·22	5·85
Normal rainfall during growing period ..	12·04	10·36	9·82
Rainfall during growing period, 1914 ..	4·57	5·19	2·04

These tables bring out very clearly several points of interest:—

1. The abnormally low useful rainfall—4.57 inches for Rutherglen, 5.19 at Werribee, and only 2.04 at Wyuna—for the six winter months, whilst the average falls for the same period are respectively 12.04, 10.36, 9.82.
2. The excessive evaporation, from a free water surface, viz., 69.38 inches at Rutherglen, 50.51 inches at Werribee, and 74.38 inches at Wyuna for the year.
3. The dry hot winds in October reflected in the excessive evaporation for the last half of the month, when the daily loss by evaporation approximated half an inch.
4. The heavy falls of "non-useful" rain in late December, amounting to more than 25 per cent. of the annual fall.

It will be noted from the tables that the best winter rainfall was recorded at Werribee. This is reflected in all the returns from this centre. At Wyuna, fertilizer, manurial, variety, seed selection, and tillage tests were carried out. No crop was, however, harvested. Germination of every plot was excellent, but the crop had to struggle for five months, during which only 1.03 inches fell, most of which was in light showers. The crop began to head out in early October, but was fed off in the hope of a good rain bringing along a vigorous second growth. The six weeks' hot weather in October and November, without a drop of rain, led to the absolute failure of the crop, in common with other non-irrigated crops in the district.

At Rutherglen, all plots, except the permanent fertilizer tests, looked well in spring, but the abnormally hot dry weather during October proved fatal to good yields, and plots which by flag and straw development promised fully 20 bushels ultimately yielded only 9 to 12 bushels.

At both Werribee and Rutherglen the outstanding feature of the tests this season were the yields obtained from the green manurial trials. These will be dealt with, however, at a later stage. The principal tests of interest at these centres are:—

1. Variety wheat tests.
2. Permanent fertilizer tests.
3. Green manurial tests.
4. Cultural and tillage trials.

We will consider the results seriatim.

Variety Wheat Trials.

At Werribee, twenty-two plots of half an acre each were sown on Paddock 7 NE with 1½ cwt. of superphosphate. Most of the varieties tested are well known, and have been described from time to time in these columns. As far as possible, every plot was given absolute equality so far as allowances of seed and manure and mode of cultivation were concerned. Also, the various plots were sown practically simultaneously. Similar procedure was followed in sowing the plots in the permanent experiment field at Rutherglen, except that the

allowance of superphosphate was 1 cwt. per acre for all plots. The results of the test, arranged in order of yield, are as follows:—

TABLE III.

CENTRAL RESEARCH FARM, WERRIBEE.

(Rainfall, Seed to Harvest, 5.19 in.)

	bush.	lbs.		bush.	lbs.
Penny	22	16	Federation	16	14
Major	20	12	King's Early	14	48
Commonwealth	19	34	American 8	14	20
Gluyas	18	56	Bobs	13	26
Marshall's	18	42	College Eclipse	13	10
Federation (Selected)	18	34	Comeback	12	42
Currawa	18	14	Zealand Blue	11	38
Yandilla King	18	6	Huguenot	11	4
Viking	16	52	Bunyip	8	14
Darts	16	30	Firbank	7	48
Avoca	16	28			

TABLE IV.

RESULTS OF VARIETY TESTS, RUTHERGLEN EXPERIMENT FARM, 1914-15.

(Rainfall, Seed to Harvest, 4.57 in.)

In Order of Yield.	No. of Plot in Field.	Variety.	Yield per Acre.	
			bush.	lbs.
1	18	King's Early	10	3
2	12	Gluyas	9	36
3	24	New Crossbred 4027	9	16
4	11	Currawa	9	8
5	25	New Crossbred 4028	8	56
6	16	Federation (Selected)	8	56
7	26	New Crossbred 4055	8	48
8	15	College Eclipse	8	45
9	19	Bunyip	8	28
10	28	New Crossbred 4072	8	21
11	22	Indian 18	8	12
12	23	Indian 20	7	53
13	10	Commonwealth	7	52
14	3	American 8	7	45
15	13	Viking	7	42
16	29	New Crossbred 4073	7	34
17	31	Federation (Check)	7	30
18	20	Indian 5	7	29
19	7	Dart's Imperial	7	26
20	1	Federation (Check)	7	20
21	2	Yandilla King	7	16
22	14	Comeback	7	1
23	6	Marshall's No. 3	6	43
24	30	New Crossbred 4084	6	38
25	9	Bobs	6	30
26	32	Cedar	6	29
27	27	New Crossbred 4062	6	1
28	21	Indian 6	5	53
29	8	Bayah	5	24
30	17	Firbank	4	56
31	4	Huguenot	4	7
32	5	Zealand Blue	3	51

From these results it appears that at Werribee the late maturing varieties have generally given the best results, whilst at Rutherglen the early maturing types have shown up best. Thus, in the Werribee results, with the exception of Gluyas, which gave 18 bushels 56 lbs. per acre, the first ten varieties on the list are either very late or mid-season wheats. On the other hand, of the ten leading varieties at Rutherglen, all, save three, namely, New Crossbred 4027, Currawa, and Federation, are early maturing varieties.

The nature of the season and the incidence of the rain is mainly responsible for this result. Thus, at Rutherglen, the spring rains absolutely failed. October was the driest and hottest October ever experienced at this centre. The early-ripening types were well on the way to maturity when the scorching winds of late October arrived. They therefore suffered relatively less from this premature baptism of heat than the late varieties.

At Werribee, on the other hand, the general development of the crop was much behind that at Rutherglen, the rain of late September (1.32 inches) and November (1.65 inches), and the more temperate weather prolonged the growing period of the crops, and turned the scale in favour of those varieties that were really the most backward in early spring. The slow-growing varieties received the greatest benefit from these rains, and ultimately gave the best returns.

When a batch of early and late maturing varieties are sown on any one farm, the nature of the season will determine which type will succeed best. Generally speaking, wherever good spring rains or a prolonged growing period can be relied on, slow-maturing types will give the best results. On the other hand, where spring rains are uncertain, and hot drying winds are prematurely ushered in, early maturing types will give the best results. South of the Dividing Range, in Gippsland, and in the mountainous districts of the North-East, late varieties, like Marshall's No. 3, will give the best returns. North of the Divide, mid-season wheats, like Federation and Currawa, Dart's Imperial, do well; whilst in the drier mallee districts, early-maturing types like Gluyas, Mac's White, and King's Early will generally give best results.

Permanent Fertilizer Trials.

The results of the various fertilizer trials may now be considered.

The yields on these plots at Rutherglen are lower than those obtained from the other series of experimental plots, and much below the yields of the bulk field tests. This is due partly to the fact that the plots are situated on poor soil, but chiefly because they were sown too late.

Table V. gives the yields for 1914, and the average returns from these plots for the past three years. During 1912, the variety Zealand Blue was sown on all plots. The variety Federation was sown in all experimental tests in 1913 and 1914.

A survey of this table will reveal several interesting features—

1. The value of water-soluble phosphates, like super. for wheat, as compared with basic slag and bonedust.
2. The marked result from relatively heavy dressings of superphosphate as compared with the amount generally applied (56 lbs.).

3. The non-necessity for nitrogenous manures on well-worked bare fallows.
4. The ineffectiveness of lime and insoluble phosphates in dry seasons.

TABLE V.

RESULTS OF PERMANENT FERTILIZER TRIALS.

Rutherglen Experiment Farm.

Three Seasons.

No. of Plot.	Treatment.	1912.	1913.	1914.	Average for 3 Years.
		bush.	bush.	bush.	bush. per acre
1	Farmyard Manure 10 tons per acre	13.3	27.9	2.1	14.4
2	Farmyard Manure 10 tons per acre + Lime 10 cwt.	17.8	28.3	5.5	17.2
3	No Manure	9.4	18.5	.6	9.5
4	Superphosphate ½ cwt.	14.4	28.5	1.8	14.9
5	Superphosphate 2 cwt.	18.7	31.8	2.4	17.6
6	Superphosphate 1 cwt.	16.2	31.0	3.5	16.9
7	Super. 1 cwt. + Sod. Nit. ½ cwt., with seed ..	19.0	28.2	3.4	16.9
8	Super. 1 cwt. + Sod. Nit. ½ cwt., in Spring ..	17.3	31.8	3.4	17.5
9	Super. 1 cwt. + Sulph. Ammonia ½ cwt. ..	14.9	29.8	3.4	16.0
10	Super. 1 cwt. + Sulph. Ammonia ½ cwt. x Potash ½ cwt.	12.8	29.3	2.6	15.2
11	No Manure	12.1	20.1	.6	10.9
12	Bonedust (P_2O_5=1 cwt. Super.) 1 cwt. ..	13.8	28.1	1.0	14.3
13	Basic Slag (Thomas' Phosphate) 1 cwt. ..	13.9	28.2	1.2	14.4
14	Basic Slag (Thomas' Phosphate) ½ cwt. Superphosphate ½ cwt.	13.4	28.6	1.4	14.5
15	Super. 1 cwt. + Lime 5 cwt.	17.4	28.7	2.1	16.1
16	Super. 1 cwt. + Lime 10 cwt.	18.3	30.9	1.4	16.9
17	Super. 1 cwt. + Lime 20 cwt.	20.2	30.2	1.7	17.4
18	No Manure	12.8	19.1	.3	10.7
19	Super. 1 cwt. + Potash ½ cwt.	17.6	31.3	1.1	16.7

Consider the various points mentioned above. Table VI. summarises the crop and monetary returns from the various dressings of superphosphate.

TABLE VI.

LIGHT AND HEAVY DRESSINGS OF SUPERPHOSPHATE.

Plot.	Treatment.	Yield.	Increase Over no Manure Due to Manuring.	Value of Increase, at 3s. 4d. Per Bushel (Gross Profit).	Cost of Manure.	Net Profit over Unmanured Plot.
		bushels.	bushels.	£ s. d.	£ s. d.	£ s. d.
3	No manure ..	9·5	..	..	..	..
4	Super., ½ cwt. ..	14·9	5.4	0 18 0	0 2 3	0 15 9
6	Super., 1 cwt. ..	16·9	7.4	1 4 8	0 4 6	1 0 2
5	Super., 2 cwt. ..	17·6	8.1	1 7 0	0 9 0	0 18 0

From these figures, the average of three seasons, it appears that a dressing of 1 cwt. super. is the most profitable amount to apply in practice. The first ½ cwt. produces an increase of 5.4 bushels per acre, which, at 3s. 4d. = 18s. over the unmanured crop. Deducting the value of the manure, this leaves a net profit of 15s. 9d. per acre. An application of 1 cwt. per acre produces a net increase of 7.4 bushels over the unmanured plot, which, at 3s. 4d. per bushel = 24s. 8d. leaving a net profit over the unmanured plot of 20s. 2d. per acre. Two hundredweight of super. produces a still higher yield, but the net profit is only 18s., as compared with 20s. 2d. per acre with the 1-cwt. application.

The indirect effect of the heavier dressings in stimulating the growth of grass on the stubbles and grass land must not be lost sight of. Profits on a wheat farm come from wool and lambs as well as from wheat, and increased carrying capacity is therefore as much to be desired as increased wheat harvest. Note, too, that, in respect to the 1-cwt. dressing, the extra crop, as compared with the ½-cwt. application, gave a higher net profit in each of the three seasons.

Nitrogenous Manures.—As has been demonstrated in previous years, the time has not yet arrived when nitrogenous manures will give payable returns on well-fallowed wheat lands. This is a very fortunate circumstance for our wheat farmers, for nitrogenous manures are the most costly of all artificial fertilizers. This may be seen by comparing plots 7, 8, and 9 with plot 6.

As an average of three years' results, superphosphate (1 cwt.) gives a return of 16.9 bushels, ½ cwt. of nitrate of soda per acre (costing an extra 7s. 6d.) applied with the seed gives no extra return. The same quantity applied in the spring gives a slight increase of .6 bushels, not enough, however, to cover the extra cost of the manure. Sulphate of ammonia is apparently even less suitable, for the extra dressing is accompanied by a slight falling off in yield. The application of potash applied either with super. or with a combination of super. and sulphate of ammonia appears to depress the yield.

The failure of nitrogenous manures to stimulate wheat yields is not difficult to understand. The processes of nitrification are extremely active in our bare fallows, and far more nitrates are formed by bacterial activity during the process of fallowing than the wheat crop can normally use up. Consequently, additions of nitrates in the form of nitrate of soda are ineffective. In wet seasons, however, or in seasons with heavy spring rains, the nitrates in the surface soil may become leached out or even washed into the subsoil, leaving a temporary deficiency in the surface layers. Under these circumstances, applications in spring may lead to a marked stimulus in growth. On stubble ploughed land, or in regions of normally heavy rainfall, nitrates for a similar reason may prove of great advantage.

Lime.—Applications of lime have not, as yet, proved profitable at Rutherglen for wheat. In wet seasons applications of lime show up well, but in a dry season the apparent effect of increased quantities of lime is to depress the yields. In 1912 (wet season), there was a steady increase in the yield as we passed from the light to the heavy dressings. In 1914 (drought), there is a falling off in yield as the dressing of lime increases. Lime has given good results when applied with stable manure.

Stable Manure.—Plot 1 alone gave an average yield of 14.4 bushels. A supplementary dressing of lime (plot 2) gave 17.2 bushels.

Finally, a note regarding the various phosphates. Citrate-soluble phosphate applied as basic slag, or insoluble phosphate applied as bone-dust, are both inferior to water-soluble phosphate (super.) for wheat crops. Super. (1 cwt.) gives 16.9 bushels as an average of three years. The same quantity of phosphoric acid, in the form of basic slag (Thomas' phosphate), gives 14.4 bushels, and, in the form of bone-dust, 14.3 bushels, or in the form of a mixture of basic slag (56 lbs.) and super. (56 lbs.), 14.5 bushels.

In Table VII., the returns from a series of fertilizer plots at Werribee are summarized.

The plots are each $\frac{1}{4}$ acre in area. In season 1913 the plots were sown on a late-prepared bare fallow, whilst in 1914 they were sown after leguminous crops cut for silage.

TABLE VII.

TABLE SHOWING RETURNS FROM PERMANENT FERTILIZER PLOTS, CENTRAL RESEARCH FARM, WERRIBEE.

Seasons 1913 and 1914.

Plot	Treatment.	First Season (1913).		Second Season (1914).		Average for Two Seasons.	
		bus.	lbs.	bus.	lbs.	bus.	lbs.
1A	Super. 1 cwt. per acre	9	12	14	16	11	44
2A	Farmyard Manure 10 tons	11	49	10	56	11	22
3A	Farmyard Manure 10 tons, and Lime 10 cwt.	12	42	8	40	10	41
4A	No Manure	7	33	5	40	6	36
5A	Super. $\frac{1}{2}$ cwt. per acre	11	6	9	16	10	11
6A	Super. $1\frac{1}{2}$ cwt.	14	2	11	36	12	49
7A	Super. 2 cwt.	13	52	11	40	12	46
8A	Super. 1 cwt., and Nitrate of Soda 49 lbs.	13	36	8	8	10	52
9A	Super. 1 cwt., and Nitrate of Soda 49 lbs. (in Spring)	12	37	9	32	10	4
10A	Super 1 cwt. (Check Plot)	13	4	10	48	11	56
11A	Super. 1 cwt., and Sulphate of Potash $\frac{1}{2}$ cwt.	12	0	9	4	10	32
12A	Super. 1 cwt., Sulphate of Potash $\frac{1}{2}$ cwt., and Nitrate of Soda $\frac{1}{2}$ cwt.	12	10	6	28	9	19
13A	Bone Fertilizer 1 cwt.	8	26	5	16	6	51
14A	Thomas' Phosphate 1 cwt.	8	53	4	28	6	40
15A	Super. $\frac{1}{2}$ cwt., and Thomas' Phosphate $\frac{1}{2}$ cwt.	12	5	5	38	8	52
16A	Super. 1 cwt., and Lime 5 cwt.	11	49	7	6	9	27
17A	Super. 1 cwt., and Lime 10 cwt.	12	21	6	0	9	10
18A	Super. 1 cwt., and Lime 20 cwt.	11	33	5	16	8	24
19A	No Manure (continuously cropped)	6	24	5	47	6	35
20A	Super. 1 cwt. (continuously cropped)	9	52	10	28	10	10

The return from the Werribee series of plots shows a marked general similarity to the results of the Rutherglen trials, except that the differences between the respective dressings are less marked. This might have been expected, for the last two winters at Werribee are among the driest ever recorded, consequently the respective dressings have not been able to exert their full effect on crop yields. Nor must it be forgotten that this land had, prior to the laying down of the permanent

experiment trials two seasons ago, been treated for many years with liberal dressings of phosphates. This would have the effect of levelling up all the yields, and masking the differential effects of the respective dressings.

In 1913 a series of plots were laid down at Rutherglen to test the values of different depths of ploughing, early and late fallowing, &c. The results for 1914 are summarized in Table VIII.

TABLE VIII.

SHOWING CULTURAL AND TILLAGE TESTS, RUTHERGLEN EXPERIMENT FARM.

Season 1914.

(Rainfall, Seed to Harvest, 4.57 in.)

Plot.	Treatment.	Results.	
		bus.	lbs.
1	Ploughed 3″ deep July, summer cultivated	6	49
2	Ploughed 5″ deep July, summer cultivated	6	49
3	Ploughed 7″ deep July, summer cultivated	7	7
4	Ploughed 9″ deep July, summer cultivated	8	10
5	Ploughed 3″ and subsoiled, summer cultivation	7	16
6	Ploughed 5″ and subsoiled, summer cultivated	7	30
7	Ploughed 7″ and subsoiled, summer cultivation	8	42
8	Ploughed 5″ deep July, and cultivated through summer ..	8	51
9	Ploughed 5″ deep July, and cultivation neglected	6	36
10	Ploughed 5″ deep October, and cultivated through summer ..	7	25
11	Ploughed 5″ deep October, and cultivation neglected	5	33
12	Ploughed 5″ deep just before seed time, and cultivated ..	3	27

Before any definite conclusions can be drawn from these tests, more data must be collected. It is worth noting, however, that whilst there seems to be little to choose between 3-inch and 5-inch ploughing, there does appear to be an advantage in deep stirring the soil. Thus, the plots ploughed 7 inches and 9 inches deep and the subsoiled plots gave substantial increases over the shallow-ploughed plots. The result is interesting, especially in view of the dryness of the season and the manifest difficulty we had in affecting consolidation of the soil on the deeper-worked plots. The after cultivation given to plots 1 to 7 was identical.

The results of plots 8 to 12 indicate that July fallow gives much better returns than October fallow, and a cultivated fallow is worth several bushels per acre more than a neglected fallow.

Finally, land ploughed immediately before seeding gave the smallest return of all the plots. This might have been expected. Time is a necessary factor in affecting a tilth, and securing that consolidation of the soil so essential for success, and stubble-ploughed land can only be expected to do well in seasons of heavy rainfall.

(To be continued.)

RESULTS OF TESTS, 1914.

LONGERENONG COLLEGE.

(Field Officer I. M. Tulloh.)

The importance of the wheat industry to the Commonwealth is obvious when it is considered that, roughly, 5,000,000 acres are annually harvested for grain in Australia. With the introduction and cultivation of drought-resistant varieties, areas which hitherto were considered unfit for wheat-growing have come under cultivation, and are now producing fair crops. Under present conditions the farmer, by using modern implements, has large areas under cultivation, and obtains a payable return from a very moderate yield per acre, but, as the country becomes more thickly populated, and land values increase, a more intense method of cultivation must be adopted, and a higher wheat yield per acre obtained. That the latter is possible is apparent when the number of important factors bearing on wheat-growing are considered, and which are not taken into serious consideration by the average farmer:—

(1) The preparation of the soil.
   - (*a*) Fallowing.
   - (*b*) Time of fallowing.
   - (*c*) Working of fallow.
   - (*d*) Rotation of crops.

(2) The selection of the seed.
   - (*a*) Selection of varieties most suitable to the district.
   - (*b*) The selection of the most prolific strains of that variety.
   - (*c*) Graded seed.

(3) Rate of seeding.
(4) Time of sowing.
(5) Prevention of disease.
(6) Economical use of fertilizers.
(7) Treatment of the young crop

The only way to determine the adaptability of these various points to certain districts is by practical experiment. A farmer has neither the time nor the facilities for carrying out and obtaining accurate results from experimental work, hence the establishment of Government Experiment Stations throughout farming centres of the world. On these Experiment Stations a wide series of experiments are carried out, the majority of which all bear directly or indirectly towards one main object—to determine by the application of science to most thorough and systematic experimenting the methods by which the resources of the soil may be brought to bear, so that the highest possible returns may be obtained by the most economical means.

In 1912 a permanent scheme of experimental work was laid down at Longerenong, and the following experiments have since been carried out:—

1. Manurial tests.
2. Seed selection tests.
3. Seed production plots.
4. Rate of seeding tests.
5. Tests of barleys.
6. Stud breeding plots.
7. Crossbred trials.

In 1914 additional experiments have been included in:—

8. Graded seed tests.
9. Time of sowing in conjunction with rate of seeding.
10. Forage plants.
11. Field trials of crossbreds.
12. Pasture manurial tests.

In order to put the results in proper perspective, some reference to the rainfall is necessary.

The following table summarizes the rainfall for the past three years:—

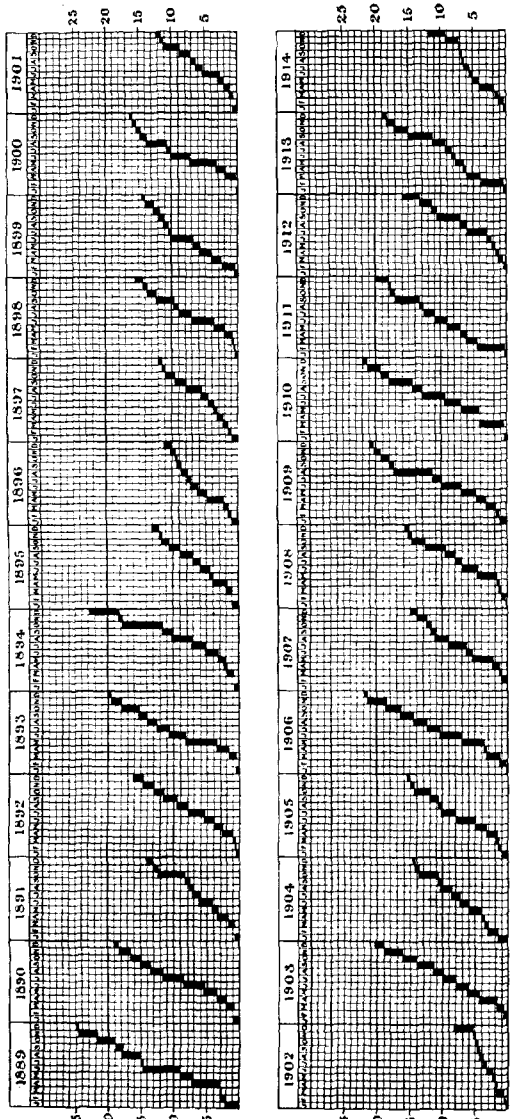
TABLE I.

SHOWING MONTHLY RAINFALL, LONGERENONG, FOR THE PAST THREE YEARS.

Month.	1912.	1913.	1914.	
January	0	18	42	
February	47	321	88	
March	55	209	41	
April	67	59	224	
May	**36**	**126**	**107**	Growing period of crop.
June	**195**	**46**	**77**	
July	**287**	**102**	**82**	
August	**115**	**200**	**36**	
September	**394**	**384**	**20**	
October	**70**	**219**	**18**	
November	177	95	209	
December	236	88	275	
Total	16·79	18·67	12·19	
Total rainfall during growing period	10·97	10·77	3·40	

The chart on the following page showing in graphical form the monthly distribution of rain during the past twenty-six years may be of interest in view of the extraordinarily dry year through which we have just passed. The information for the preparation of this chart was supplied by Mr. E. G. M. Gibson, of Longerenong College.

The rainfall of 1914 would probably have sufficed for a tolerably good crop had the incidence of the rain been normal. But the distribution was quite abnormal. Of the 12.19 inches of rain for the year.



RAINFALL CHART
LONGERENONG AGRICULTURAL COLLEGE.
Vertical columns represent 1 Month. Vertical distances represent 1 Inch

only 3.40 fell during the growing period, all of which fell in light non-saturating showers. This undoubtedly was the reason for the crop failure in the district for 1914. What crops were grown on the experimental plots, therefore, in 1914 may be mainly attributed to the reserves of soil moisture conserved from the previous season.

The Manurial Trials.

The manurial trials consist of fourteen plots, the arrangement of which and the nature of the experiment can be seen in the table below. The yields from the various plots for the last two years are given:—

Plot.	Treatment (per Acre).	Yield per Acre.		Average for Two Years.
		1913.	1914.	
		Bush.	Bush.	
1	No manure	17·16	2·11	9·63
2	Super., 56 lbs.	25·66	5·10	15·38
3	,, 1 cwt.	29·16	5·81	17·48
4	,, 2 cwt.	29·66	6·10	17·8
5	,, 1 cwt.; lime, 5 cwt.	29·00	6·76	17·88
6	,, 1 cwt.; lime, 10 cwt.	29·83	7·14	18·48
7	,, 1 cwt.; nitrate of soda, 40 lbs. ..	30·66	6·43	18·59
8	No manure	17·66	3·91	10·78
9	Thomas' phosphate, 1 cwt. per acre ..	18·83	4·57	11·70
10	Super., 1 cwt.	30·00	6·57	18·28
11	,, 1 cwt., + nitrate of soda, 40 lbs.; sulph. of potash, 40 lbs. ..	30·00	6·10	18·05
12	,, ½ cwt., + Thomas' phosphate, ½ cwt.	27·66	6·40	17·03
13	,, 1 cwt., + nitrate of soda, 40 lbs., top-dressing in spring	34·33	7·14	20·74
14	Farmyard manure, 10 tons	24·83	4·38	14·60

Sown with Federation at rate of 75 lbs. per acre under equal conditions.

It will be noticed that two plots are left unmanured. These act as check plots, and enable comparative results to be made.

Owing to the dry autumn of 1912, there was no germination of weeds on the fallows before sowing time, so that the wild oats, which are very prevalent in the district, germinated at the same time as the wheat, and a rather dirty crop resulted. Consequently, the yields of several plots (more badly affected than others) were considerably reduced.

In 1913 the season was a good one, and the natural conditions throughout the experiment were similar.

Owing to the severe drought during the past season (1914) the yields obtained are very low.

The noticeable features of those plots manured with superphosphate have been (1) that the germination is a little quicker than on those plots not manured with superphosphate; (2) a quicker growth in the earlier stages (thus enabling the crop to get a better control over weeds); (3) a taller growth; (4) earliness in ripening (these plots ripening from two or three days earlier than the plots receiving no superphosphate);

and (5) the crop presents a much brighter green colour, and has a much healthier appearance.

Plot 9 (Thomas' phosphate, 1 cwt. per acre) is very similar in appearance to the unmanured plots. Plots 5 and 6 (receiving dressings of lime) have, up to the present, not given results to justify its application.

Nitrate of soda (sown with superphosphate, 1 cwt.), has not shown any payable increase, but as a top dressing in spring (Plot 13) it has consistently given the highest yield. Farmyard manure (Plot 14) has been very similar to the unmanured plots.

It must be remembered that only after a trial extending over a number of years can any definite information be derived from these experiments, for owing to the variability of the seasons, some plots may be more favorably affected some years than others.

An important factor to be taken into consideration in the manuring of the wheat crops is the resulting effect of the manure on the pasture. It is known that heavy applications of superphosphate to the wheat crop have caused vigorous growth of the pasture following, and although the wheat yields may not have justified such a heavy dressing, yet it has been amply repaid by the increase in the stock-carrying capacity of the pastures.

SEED SELECTION TESTS.

The object of these tests is:—

1. To test the suitability of different varieties to local conditions.
2. To produce pure seed.
3. To improve the varieties by selection.
4. To institute a method of selection which is practicable on every wheat farm.

The system adopted with these plots is as follows:—Each plot is sown every year with selected seed, exactly the same weight of seed and manure being sown on each plot, and all are sown under similar conditions, receiving the same treatment throughout the year, so that as accurate a test as possible of the different varieties may be obtained. Before harvest each plot is carefully gone through, and a number of the best heads are selected from the best plants of each variety. Care must be taken in making the selections that the plants from which the heads are chosen have not had any advantage in environment, thus causing them to grow more vigorously than others.

The results that have been obtained at Longerenong during the last three years clearly demonstrate the advantage gained by this system of selection.

The following are the yields from Federation wheat, selected and unselected, sown in adjacent plots to determine the effects of selection:—

FEDERATION.

1912.—Selected, 43.25 bushels; unselected, 34 bushels.
1913.—Selected, 36.2 bushels; unselected, 24.6 bushels.
1914.—Selected, 9.77 bushels; unselected, 5.73 bushels.

Varieties that have been included in these tests are given with the yields in the table below. Those varieties unsuitable to the district have been rejected and replaced by other varieties:—

SEED SELECTION TESTS. (LONGERENONG).

Plot.	Variety.	Yield per Acre.
		Bushels.
	1912.	
1	Kubanka	29·0
2	Turkey Red	30·75
3	Marshall's No. 3	32·75
4	Huguenot	12·75
5	American 8	27·75
6	Federation (selected)	43·25
7	Zealand Blue	24·00
8	Dart's Imperial	28·43
9	Crossbred 28	20·93
10	Currawa	34·93
11	Bayah	32·12
12	Federation (ordinary)	34·5
13	Commonwealth	30·5
14	Gluyas	32·93
15	King's Early	34·25
	1913.	
1	Federation (selected)	36·29
2	King's Early	31·35
3	American 8	29·39
4	Huguenot	16·52
5	Yandilla King	24·91
6	Gluyas	24·68
7	Dart's Imperial	29·99
8	Zealand Blue	27·55
9	Federation (ordinary)	24·66
	1914.	
1	Federation (selected)	17·23
2	American 8	11·92
3	Dart's Imperial	11·92
4	Marshall's No. 3	12·35
5	Commonwealth	12·35
6	Currawa	11·49
7	Bayah	7·59
8	Federation (selected)	9·77
9	Viking	7·47
10	Bunyip	4·59
11	College Eclipse	12·21
12	Gluyas	9·48
13	King's Early	7·90
14	Yandilla King	7·04
15	Federation (ordinary)	5·03

No reliability can be placed on the yields of these plots for 1914, as owing to the dry season some of the stud cereal and crossbred plots, especially the late sown plots, had to be irrigated to insure preservation

of the seed, and the irrigation water accidentally flowed over portion of the first six selection plots. Comparisons were made, however, on the unirrigated portions of these plots, and notes on the drought-resisting qualities of these wheats will be given later.

RATE OF SEEDING TESTS.

This test includes six plots, in which rates of seed are sown varying from 30 lbs. to 120 lbs. per acre. In 1914 two series of these plots were sown, the first sown early in the season, and the second three weeks later. The yields from these plots are as follows:—

Plot.	Seed per Acre.	1913.	1914.	
			Early Sowing, 26th May.	Late Sowing, 25th June.
	lbs.	Bushels per Acre.	Bushels per Acre.	Bushels per Acre.
1	30	16·00	8·14	3·75
2	45	17·66	11·01	5·94
3	60	20·16	11·73	5·37
4	75	27·00	10·69	5·94
5	90	28·83	11·96	6·41
6	120	28·0	10·34	6·41

Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, giving a Demonstration of the Advantages of Wheat Selection at Longerenong before Members of the Horsham Agricultural Society.

In 1913 it was noticed that the lighter the rate of seeding the more wild oats appeared in the plots. Plots 5 and 6 were both clean, Plot 4 had wild oats growing thinly through it, while Plots 1, 2, and 3 became dirtier as the rate of seeding decreased.

In 1914 the development of the plants varied inversely to the rate of seeding. This was more marked in the earlier sowing. Plots 1

and 2 were very thin (Plot 1 being the thinner), but the plants were strong and healthy with large ears and plump grain; the straw of Plot 2 was slightly taller than that on Plot 1. Plot 3 was shorter in the straw than Plot 2, the heads were smaller, and the crop much thicker. The same conditions continued in Plots 4 and 5, the straw becoming shorter with the increased seeding, and consequent increase in the thickness of the crop. The heads also became shorter, and the grain less plump. Plots 5 and 6 were very similar to each other, both being very thick, very short in the straw, and possessing very small, poorly-developed heads.

Graded Seed Tests.

The practice of grading the wheat for seed is becoming deservedly popular throughout Australia, for not only does an increased yield result, but all the rubbish, cracked grain, and seed of weeds are taken out by the process, which otherwise would be sown in the field. In 1914 the first graded seed tests were carried out here under field conditions, but owing to the drought the season was a bad one for tests of this nature; but experiments conducted in other parts of the State of late years show that graded seed yielded up to 2½ bushels more per acre than ungraded seed. A farmer can get his seed wheat graded at a price of from 6d. per bushel, so that, with an extra expenditure of from 7d. to 8d. per acre, an increased return from 4s. to 7s. would result.

Trial of Barleys.

In 1912 only four Cape barleys were sown, but in 1913 eleven varieties were tested, of which three were rejected in 1914, and the test now includes eight plots, in which four Cape and four malting barleys are being tested from year to year.

Why barley is not grown more largely in the district is curious, for the excellent returns from these plots should justify its cultivation.

In 1913, 80 bushels per acre were obtained from Roseworthy Oregon (6-rowed barley), and the highest yield from the malting barleys was from Gisborne, which yielded 60.2 bushels per acre.

As seen in the table below, all the barleys did well for this season, but Skinless, Goldthorpe, and Golden Grain were rejected owing to their unsuitability to the district—the former being very weak in the straw, while the two latter were unable to stand the winds prevalent here at harvest time, and shelled badly.

In 1914 the barleys were not sown till the latter end of June, and then an extremely small amount of rain fell during their growing period. However, Pryor (malting) proved itself drought-resistant to a very high degree, for although the straw was very short, it retained its fresh appearance right through the season, and produced a fine plump grain, yielding 10.45 bushels per acre. None of the other three malting barleys did well at all, being overcome through the dry conditions.

Roseworthy Squarehead yielded the highest of the Cape barleys, but these varieties were also severely affected by the lack of moisture, and ripened very unevenly, and were very patchy.

YIELD OF BARLEYS.

Variety.	Yield per Acre.		
	1912.	1913.	1914.
	Bushels.	Bushels.	Bushels.
Roseworthy Squarehead	44·1	68·8	8·36
,, Oregon	35·2	80·2	6·54
,, Shorthead	48·9	76·2	7·58
Pryor	35·25	44·2	10·45
Cape	..	74·0	7·32
Kinver	..	46·6	1·96
Archer	..	50·8	1·56
Gisborne	..	60·2	0·26
Skinless	..	8·0	..
Goldthorpe	..	43·2	..
Golden Grain	..	23·0	..

FORAGE PLOTS.

In 1914 the following plots were sown down for forage:—

1. Dun Peas.
2. Beerseem.
3. Sulla Clover.
4. Peas, Tick Beans, and Vetches.
5. Rye and Vetches.
6. Rape.
7. Kale.
8. Italian Rye Grass.

Heavy frosts in July and August killed the Beerseem and Sulla Clover, and retarded the growth of the Kale and Rape to such an extent that the plants remained small and stunted through the season. The combination of the frost and drought kept back the Rye Grass, and practically none reached maturity.

Plot 1. Dun Peas.—Yielded a crop of 2 tons 7.15 cwt. per acre.

Plot 4. Tick Beans, Peas, and Vetches.—Yielded 1 ton 15 cwt. per acre.

Plot 5. Rye and Vetches proved very hardy, and withstood well the adverse conditions of the season. The Rye reached an even height of 2 ft. 3 in., and yielded 3 tons 12.13 cwt. of fodder per acre.

PASTURE MANURIAL TRIALS.

In May, 1914, five plots of 1 acre each were laid out, and the pasture dressed with the following manures:—

Plot 1.—Superphosphate, 1 cwt. per acre.

Plot 2.—No manure.

Plot 3.—Thomas' phosphate, 2 cwt. per acre.

Plot 4.—Superphosphate, 2 cwt. per acre.

Plot 5.—Superphosphate, 2 cwt. per acre + nitrate of soda, 1 cwt. per acre.

This experiment has been carried out at the Rutherglen Experiment Station, with the result that the increase in the pasture and the vigorous growth of clovers over the heavily manured plots increased the stock-carrying capacity of the land to such an extent that handsome profits would result.

No results could be obtained from these plots at Longerenong this season, as all the grass dried off early in the season through drought conditions; but it is intended that these tests be continued for a number of years, so that the effects of the various dressings of manure on our local pasture can be fully determined.

The following summary of the notes taken on the behaviour of the varieties of wheat grown in the Seed Selection Tests under the drought conditions existing throughout 1914 may be of interest:—

Federation was the first of the wheats to lose its green appearance, the lower flag all turning brown early in September, and only the higher foliage retaining a fresh green appearance.

Stud Cereal Plots, Longerenong Agricultural College.

It held over a great deal better than the majority of the other varieties, developed fair heads, which came well out of the shot blade, was only slightly tipped, and yielded a fairly plump sample of grain, and gave the highest yield in the seed production plots.

Yandilla King.—Owing to the dark-green foliage of this variety it seemed better able to keep its colour than earlier varieties, which, as a rule, have a lighter green colour. This wheat retained its dark-green appearance right up to heading time, when the heads came well out of the sheath, but were rather badly tipped. The sample of grain was a fair one.

King's Early and Gluyas.—Both these varieties held out well, and were very similar in growth throughout the season. The straw was

short and the heads small, but well filled, and yielded a fair sample of grain. They both showed their ability to mature a good sample, and produce a light crop under very severe drought conditions.

Bungip.—This variety continued growing, though slowly, through the season till heading time, when it appeared to collapse, and gave the impression that in trying to grow normally under the severe conditions became exhausted. It yielded the poorest of all, and the extreme weakness of the straw this season was very marked.

Bayah.—This variety was also very badly affected; the heads small, and badly tipped, just showing above the sheath. All through the season it presented a very dry and sickly appearance.

Curraua.—This variety was one of the best drought resisters undergoing trial, always appearing fresh, and headed well. It yielded a fair return of grain.

Commonwealth.—Was very similar to Bayah in its behaviour, and its yield was chiefly due to the water the plot received.

Marshall's No. 3 and Dart's Imperial.—These two varieties showed up very poorly. Throughout the season they had a hard, dry appearance, and at heading time practically all their flag had withered. The heads were very poorly developed and very badly tipped. The majority never got clear of the sheath. In many cases not more than 4 to 6 grains were found in the heads. These plots received a considerable amount of water, thus causing the comparatively high yield shown in the table.

American 8.—This variety with its slender straw and scanty flag is likely to prove of value as a drought resister. It did comparatively well this year; the heads, though small, were not tipped, and the sample of grain was good.

College Eclipse.—This wheat showed itself to contain true drought-resistant qualities. It continued growing naturally, though slowly, right through the season; headed and ripened naturally. The heads were well away from the sheath, and were comparatively well developed, while the sample of grain was good and the yield very satisfactory. It grew to a height of 2 feet, and proved itself, at least for this season, to be the best drought resister undergoing trial at Longerenong.

GAIN IN WEIGHT.

An experiment carried on under Government auspices showed that in 40 days' storage at New Orleans, a 24-lb. sack of flour, which had 12.37 per cent. of moisture on 3rd September, had increased to 13.84 per cent. of moisture by 13th October. The atmosphere was humid during the time of the experiment, and the moisture content of the flour varied with the condition of the atmosphere. The moisture content of the flour was rather high to start with.

In all probability a drier flour would have shown a much larger net gain in moisture in the time of trial.—*Milling*, 21st November, 1914.

The Use, Construction, and Cost of Concrete Channels and Underground Pipe Lines in Orchard Irrigation.

By S. A. Cock, Orchard Supervisor and Irrigationist, Bendigo and Northern District.

Since the publication of the articles on "Citrus Culture in Victoria" in the *Journal of Agriculture, Victoria*, March to December, 1913, it has been found necessary to add the following to Part VI., September, 1913, pages 535-541, "Irrigation, Cultivation, and Drainage."

In the sandy Mallee soils, and the pine ridge country of the Rochester, Tongala, and Cohuna areas, seepage is prevalent, and the attendant results very often injurious to citrus and other plantations.

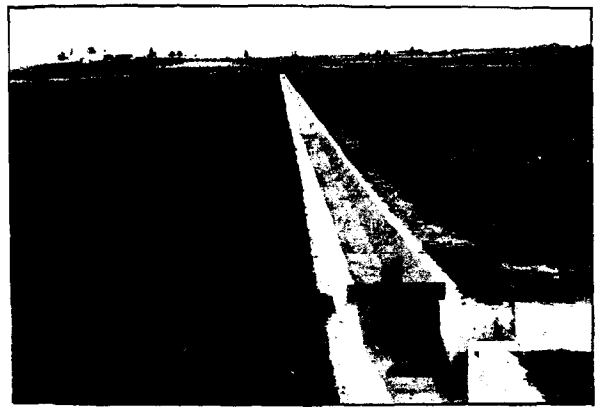


Plate 36.—Concrete Channels, Nyah, Showing Outlets, Gates, and Checks.

In all seepage areas the main distributary channels should be concreted to safeguard the adjoining land. The land-holder could then, by the use of concrete channels in place of delver drains, reduce the danger of seepage to a minimum. Plate 36 shows concrete channels as laid down at Nyah and Mildura. The usual measurements of the channels are 28 inches across the top, 10 inches across the bottom, and 6 inches deep, inside measurement. Width of sill at surface level 2½ inches; thickness of concrete, 1½ inches.

These channels are made of one in six cement concrete, using sand only with the cement, or they are made of one part cement, two parts sand, and three parts lime or stone rubble.

Channels are also made of lime concrete, using one part lime, three parts sand, and five parts lime or stone rubble.

At the bottom of the channel, outlets made of 2-inch galvanized iron piping are inserted. These outlets have a gate inside the channel; the

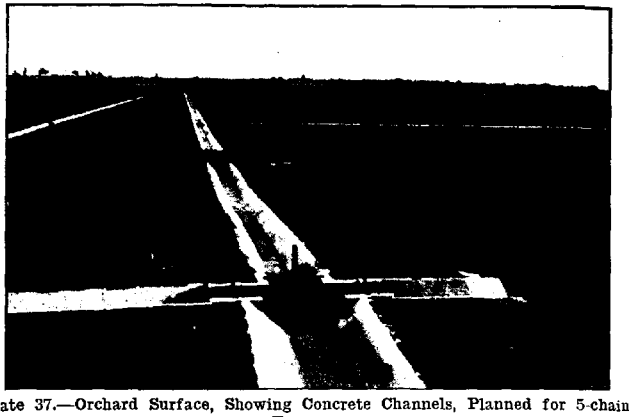


Plate 37.—Orchard Surface, Showing Concrete Channels, Planned for 5-chain Furrows.

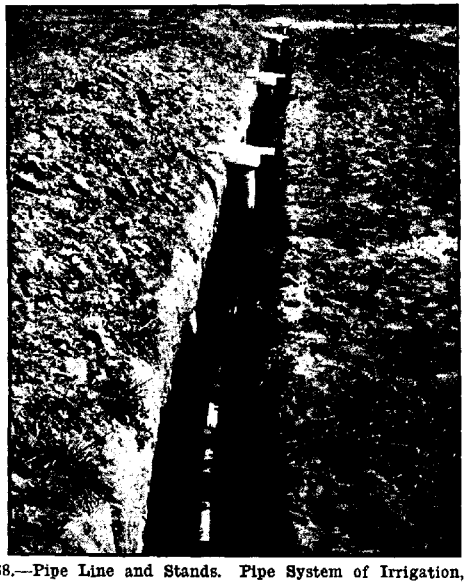


Plate 38.—Pipe Line and Stands. Pipe System of Irrigation, Nyah.

gate works in a slot cut in the pipe, and the pipe or outlet should be sufficiently long to bring the water well away from the channel about

24 inches. The outlets are placed at every main furrow according to the distances the rows of trees stand apart. Checks are placed wherever

Plate 39.—Pipe System of Irrigation, Nyah, Showing Outlets and Gates.

required in the channel as shown, and are fixed in slots made in the channel at intervals necessary to keep the water at a height sufficient

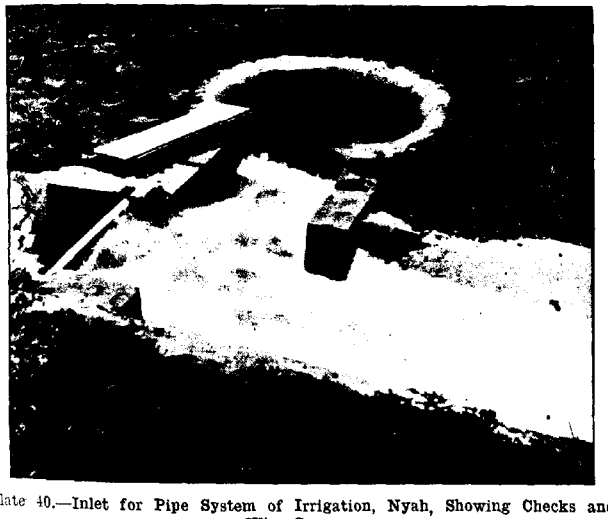


Plate 40.—Inlet for Pipe System of Irrigation, Nyah, Showing Checks and Wire Screen.

to fill any given number of outlets, according to the incline of the channel.

The cost of making these channels, as illustrated and explained, is approximately from £2 10s. to £3 per chain. Care is necessary in the bedding of the outlets, and in the proper mixing and laying of the concrete. The upkeep of the channels is very trifling in cost, but they require to be washed at intervals with lime or cement. Plate 37 shows part of an orchard at Nyah planned for irrigation on a five-chain length of furrow, the two parallel channels in the centre and left representing the main drive-way. On this property £500 has been spent on open concrete channels for the prevention of seepage.

On long slopes and undulating surfaces the underground pipe system is used in place of concrete channels. Plate 38 shows a section of these pipes; they are bedded 18 inches deep, and every 22 feet, or the distance the rows of trees are apart, a [redacted] length of pipe is inserted in the pipe line, and a stand brought to and above the surface 6 inches. Across the opening of the stand pipe, and at right angles to the pipe line, a piece of 2-inch galvanized iron pipe, 18 inches or 24 inches long, is laid, and immediately on the under surface of the iron pipe, at its centre, a ∧ piece is cut out for the ingress of water, and gates fixed in slots at both outlets as shown. This piping and opening of stand-pipe is now domed over with concrete, and made water-tight. Plate 39 shows stand-pipes, outlets, and gates raised for irrigation, and Plate 40 shows inlet to pipe line from open concrete channel, with wire screen to arrest ingress of *débris*, and checks to alter flow of water from inlet to open channel, or *vice versâ*. The inlet is situated on the highest eminence commanded by the gravitation channel, and the water rises to the same height anywhere on the pipe line, on the principle of a syphon.

At the lowest elevation of a pipe line a concrete well is formed for the deposition of *débris;* this is kept water-tight by a felt-lined cover-board, or movable concrete cap, securely fixed by screws or bolts, so as to permit the removal of *débris* and flushing of pipe line. The pipes generally used for this system of irrigation are 6-inch glazed earthenware. Using what are termed as pottery seconds, the cost per chain for pipes, outlets, and labour should not exceed £2 10s. per chain.

This system could be applied to any surface, doing away with open channels altogether, and is suited either to gravitation or power. It may be worked by any size or variety of water-tight pipe, always taking into consideration the pressure of water from power or gravitation.

On very steep inclines, and where power is used to supply water, the "Nunan" spray system, or over-ground piping, is sometimes used. It does not promise to become popular on large areas, but may be recommended on small areas of uneven surfaces or steep inclines, where power only is used.

GUARANTEES FOR LIME.

The Staffordshire Chamber of Agriculture has called attention to the necessity for farmers getting a guarantee when buying lime. A case was instanced where a parcel of 20 tons of lime was purchased, and was found, on analysis, to be practically worthless for agricultural purposes. The county agricultural instructor expressed the opinion that farmers should not buy lime which contained less than 80 per cent. caustic lime.—*Fertilizers and Feeding Stuffs Press,* 21st November, 1914.

BEE-KEEPING.

By F. R. Beuhne.

FEEDING BEES.

Feeding bees is carried out in Europe and North America to a far greater extent than in Australia, where nature nearly always provides the necessary supplies; only twice has it been necessary to supply the bees with artificial winter stores in the writer's twenty-seven years of bee-keeping.

Feeding is done for three distinct purposes. (1) To stimulate brood-rearing. (2) to tide over a period of dearth during the working season, and (3) to supply the colonies with winter stores.

Stimulative Feeding.

This is practised in Europe and very extensively in the United States of America. The object is to have a stronger force of worker bees in the hives by the time an early honey flow is expected than could possibly be present if the colonies were left to develop naturally under the influence of the gradually rising temperatures of spring. The feeding in this instance consists in giving each colony daily a small amount of sugar syrup of equal weights of sugar and water, given blood-warm in a feeder inside the hive, preferably towards evening. Feeding should commence five to six weeks before the honey flow, so that most of the bees raised will be of field age when the expected flow is at its best.

In Victoria, in normal seasons, there is sufficient natural stimulation early enough in spring to fully develop the strength of the colonies for the main honey flow without resorting to artificial stimulation if the bees are favorably located during the winter and early spring. In localities where an early honey flow occurs it may, however, yet be found that stimulation feeding, judiciously done, would be very profitable.

Starvation Feeding.

This is done to tide the bees over a period of complete dearth of nectar such as sometimes occurs even in midsummer, caused by a break in the succession of flowering eucalyptus, or by a spell of cold weather extending over many days. Under these conditions bees will cease breeding altogether, and may even throw out all young brood unless promptly given food.

The generations of bees missed through a stoppage of brood-rearing or destroyed for lack of stores will be badly missed in a honey flow a month later. The remedy is to give each colony one comb of honey if such has been kept on hand for such an emergency; if not, to give each a dose of sugar syrup, ½ pint to 1 pint, according to the strength of the stock

FEEDING FOR WINTER STORES.

As indicated before, it does not often become necessary to supply artificially the amount of stores of honey necessary to safely bring the colonies through the winter and ensure their normal development in spring. The wintering problem as found in most parts of the northern hemisphere does not exist here; still, a certain amount of attention is required at the end of the season, which, unfortunately, is too often not given, with the result that, although the bees in most instances struggle through somehow, the development of the colonies in the following spring is greatly retarded and interfered with, by the absence of sufficient good stores, by too much space and the scattering of the stores (often of watery honey) in too many combs.

The ideal condition for winter is to have each colony in a single story, on just as many combs as the bees can cover, and these combs well filled with sealed honey or syrup. In seasons when the honey flow declines gradually, this condition is obtained by taking all supers off before the flow is quite over, when the usually thin nectar will be stored in the combs covered by the bees, and there ripened and sealed, instead of in the super combs, where it would candy or sour during winter, and causing, when consumed later on, dysentery amongst the bees.

When the honey flow ceases suddenly, the brood combs will often be found with much brood but very little honey when the supers are removed. It then becomes necessary to supply the bees with sufficient good winter food to carry them through till spring. The amount will vary, according to the strength of the colony, from 20 to 40 lbs. of sealed honey or syrup.

If the apiary has been free from foul brood for several seasons, any thin honey found in the combs of the supers which were taken off may be extracted, and, after being heated to 170 deg. Fahr., fed back to the colonies till each has enough. Colonies below the average strength, which cannot properly ripen any honey or syrup given them, it is best not to feed, but to supply them with stored and sealed or partly sealed combs from stronger colonies abundantly fed. If there is suspicion that foul-brood germs may be present in any of the combs, it will be best not to feed back any of the honey extracted, but to give instead a syrup made by dissolving 2 parts of 1A sugar in 1 part (by weight) of boiling water. Even with sugar at 17s. 6d. a bag, sugar syrup is cheaper than and just as good as honey of the same density, while all risk of infection is avoided.

Feeding for winter stores should be done rapidly, and while the weather is still fairly warm. The syrup (or thin honey) should be given blood-warm, and of the density given above (2 lbs. of best sugar to 1 lb. boiling water). All feeding should be done inside the hive, with the twofold object of keeping the food warm as long as possible and of preventing the access of bees from other hives.

As feeding for winter stores is so seldom required, there are perhaps few apiaries in which the necessary feeders are on hand. To make sufficient feeders for a fair-sized apiary would take some time and considerable material, and on this account the bees are sometimes left to take their chance at times when prompt feeding at the right time would insure their safe wintering, and a vastly greater honey crop in the following season.

The Simplicity feeder, as sold by supply dealers (Fig. 1), while quite suitable for stimulative feeding, is altogether too small for feeding winter stores. The frame-feeder (Fig. 2), while still somewhat on

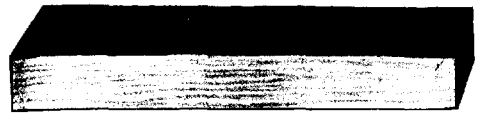


Fig. 1.—Simplicity Feeder.

the small side, is more suitable, but rather expensive. The writer, when suddenly confronted with the problem of feeding a large number

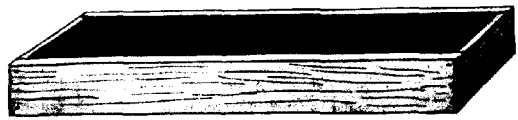


Fig. 2.—Frame Feeder.

of colonies heavily in a short space of time, used 7-lb. honey tins for this purpose. All that is necessary is to have for each tin a piece of

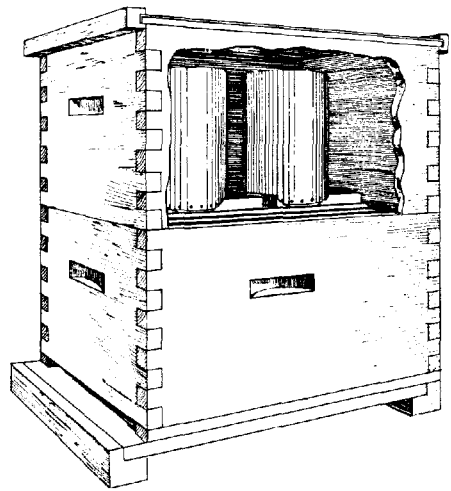


Fig. 3.—Inverted Honey Tin Feeders on Hive.

thin board 6 inches by 6 inches, to which is nailed a rim $\frac{3}{8}$ inch thick and $\frac{1}{2}$ inch deep, with hot wax run all over joints to make them watertight. The lever tops are removed from the tins; if the tins have

wire handles, these are pulled out, and the clips holding them bent down so that the tin will stand level when upside down. A few holes are punched into the side of the tin with a 1-inch nail, as near the top edge as possible. The tin is then filled with syrup, the rimmed board put on top (rim downward), and, while holding the tin from the bottom with one hand and pressing the board on tightly with the other, the tin is swiftly turned upside down and stood on a level surface. The little shallow trough formed by the board will be full of syrup up to the top of the holes punched into the tin. When placed on the top of the brood frames, as shown in the illustration (Fig. 3), as the bees sip up the syrup more will ooze out, till the tin is empty. Of course, the top of the brood frames should be level in all directions, otherwise all the syrup will run out if the inverted tin stands very unevenly.

A super from which a sufficient number (or all) of the frames have been removed is put over the tin or tins, and the hive cover on top. Several tins, sufficient to supply the needs of the colony, can be put on at the one time, and any kind of round tin can be used, washed out afterwards, the fine holes closed with solder, and the tins used for packing honey. Square or flat tins are not suitable, as the sides give way inward, and allow too much syrup to escape.

WHEAT-GROWING AT MITTA MITTA.

Details of interesting tests with wheat have come to hand from Mitta Mitta.

Mr. John Courtney, of Mitta Mitta, obtained five varieties of wheat—Bayah, Genoa, Zealand Blue, American No. 8, and Marshall's No. 3—from the Rutherglen Experiment Farm in 1913. He sowed them on chocolate loam soil in 1913, and obtained the following results:—

Marshall's No. 3.—22¼ bushels per acre.
American No. 8.—20¼ bushels per acre.
Zealand Blue.—16¾ bushels per acre.
Bayah.—13½ bushels per acre.
Genoa.—10½ bushels per acre.

Federation wheat had been tried in previous years in the district but without success. Of these five varieties, Marshall's No. 3 and American No. 8 gave the best returns. Fully a bag to the acre of American No. 8 was lost owing to the tough heads and the difficulty of stripping this variety. Mr. Courtney decided to sow Marshall's No. 3 in 1914 on a larger area, and accordingly prepared 60 acres of land of which 20 acres was sown at the end of May, and 40 acres during the first week of July. The early-sown crop averaged 30 bushels per acre, and the late sown 21 bushels per acre. The crop was harvested with a combined harvester. The seeding allowance was 1½ bushels per acre, and the manure allowance 1½ cwt. of phosphate per acre. The farm is 37 miles from Tallangatta, the nearest railway station, and the carting cost 6d. per bushel.

THE OLIVE.

L. Macdonald, F.R.H.S., Horticulturist, Agricultural College, Dookie.

(Continued from page 160.)

VARIETIES—*continued.*

The following varieties comprise the great majority, if not all, of those found growing in the Commonwealth. A few kinds new to our conditions are being introduced from year to year, but many of these have not fruited yet. It is probable, however, that some of them may be valuable for further planting. Many seedlings are found growing in different places, some showing great promise both as picklers and oil olives, but their special qualities have not been sufficiently established, either by accurate laboratory testing or commercial experience, to warrant extensive planting. However, it is sufficiently demonstrated by the great range of forms and the apparent quality of many of the seedlings here that our conditions seem to favour the production of new kinds of outstanding merit; and there is good reason to believe that, with careful selection and testing, we may be able to originate kinds in advance of those growing elsewhere.

The identity of the varieties known as "Silver Eye" and "Bird's Eye," which may be identical with "Hare's Eye" or (Ojillo de Liebre or Ojo de Liebre), and "Black Italian," and "Large Fruiting," &c., appears to be somewhat obscure. Although some of them seem to hold their popularity with certain growers, it is considered inadvisable to advocate them for more general planting until their position as economic kinds is more clearly defined.

Correggiola—*Syn., Grassajo, Frantajo.*—An Italian variety, barely medium size, obovate in shape, a good grower and cropper, ripens rather unevenly throughout tree, hangs well. Makes a good-quality oil in great abundance. An high-class oil variety, and strongly recommended for planting for that purpose.

Common or Broad-leaved Mission.—Believed to be identical with Cornicabra variety of Spain. There appears to be several kinds of Mission olives, but it is the Common or Broad-leaved Mission olives that are so largely cultivated for their oil. The original trees of this variety were found growing at the old mission stations at San Diego, in Lower California. As these trees are believed to have been introduced by the Jesuit monks from Europe, it is more than likely that this kind is known under other names in some places bordering the Mediterranean. Some writers claim that it is identical with Olivier de Grasse, Plant de Salon, Tabasquo, &c., while others believe it to be also known as Rostrata, Rapanier, Cornaud, Corniale, Picudo, Tetudillo, Picual, &c. However, it appears to be fairly certain, by the evidence before me, that a number of these names at least are applied to other varieties differing in many respects from the Mission, and cannot be accurately applied to that kind. As this kind has gained its fame chiefly through its popularity in American cultivation, the name used in that country appears to have the greatest claim for adoption here.

Tree vigorous, upright grower, and good cropper. The leaves are dark-green with well-marked veins, underside very whitish. Fruit is large, and turns black when fully ripe. This variety is noted as one of the very best, if not the best olive known to American cultivation, according to reports it is uniformly prolific in varying situations. It produces a first class oil in abundant quantities, and is also a first class pickler. The only disadvantage with this kind as an oil olive is the somewhat irregular ripening of its fruit. Consequently, to get the best results, the trees have to be picked over more than once. Highly recommended for commercial planting.

Herbequina—Syn., Arbequina (Salerno (?)).—This variety was introduced here from Cataluña, in Spain, by Mr. F. de Castella. He informs me that it is most esteemed in that country for quality and fruitfulness, and was strongly recommended as an oil olive. It does not appear to have any synonym by which it is known to other countries, and is not even mentioned by many of the best known writers

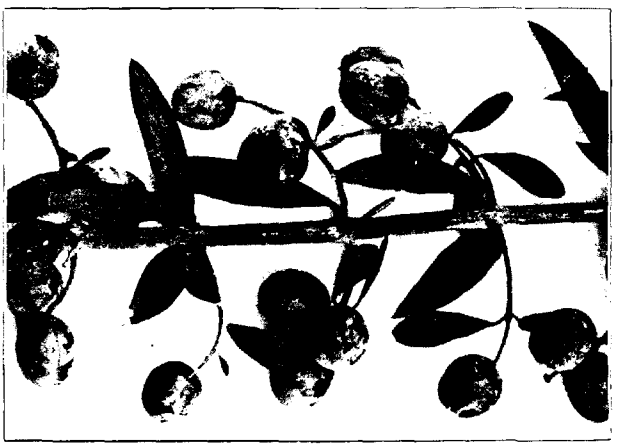


Fig. 30.—Herbequina Olive.

on the subject. The test (24.80) per cent. of oil from the whole olives, and 45.10 per cent. on the dry basis) obtained by Mr. Scott, Chemist for Agriculture, from some of the whole fruits, the first produced here, is promising, and it may prove a valuable sort for planting. However, further tests must be made to establish this. The tree is a good and shapely grower, carrying an abundance of laterals on the main branches, which tend to come into fruit early. Ripens about 17th of May. Fruit medium size, obovate, full at base and bosom, tapering quickly to apex, borne solitary or in twos, threes, or fours on short pedicles from long peduncle; pale-green with white dots, changing slowly and in patches to violet, and when fully ripe violet-black with white dots; hangs well. Unsuitable for pickles, but a promising oil variety. **Insufficiently tested here yet.**

Pleureur.—Introduced into South Australia, and probably confounded in some of the groves with Bouquettier, which is responsible for the high reputation of the latter in some instances. (*Believed to be identical with Olivier de Grasse, Plant de Salon, Cougniale, Tabasquo, Olivier a fruit de cornoulier, O. europea cranimorpha medio fructu cornu of* (*Gouan*), *L'olea corniola of* (*Risso*), *L. olivier Pendulier of* (*Riondet*). Tree fairly good grower and good cropper; leaves rather long, narrow, shapely, short petiole; fruit medium size, roundish oval, borne in twos and threes chiefly on short pedicles on medium peduncle; hangs well and ripens rather unevenly. This variety is unsuitable for pickling on account of size, but is strongly recommended for planting as an oil olive.

Picholine—*Syn. Pijouline, Picholin, Saurine, Corrias, Collias, Colasse, Sauseu, Saugen, Saugin, Saurengue, Plant de Saurin, Surine punchuda, Piquotte, Piquette, Lechin, Pignola, Acquillo, Lucques batarde, O. ovalis, O. europea saurina, O. europea oblonga, O. frustu oblonga minore, O. minor oblonga.*

Tree medium grower, fairly good and regular bearer, leaves long and narrow, inclined to recurve. Fruit long and curved, with stone of characteristic shape. Highly esteemed as a pickling variety in France owing to its fine quality as green pickles; also makes a good oil, but not in such abundant quantities as some other kinds.

Manzanillo—*Syn., Pomiformis, Ampoullier, O. spherica.*—Also said to be identical with the French Redonal, but not clearly established as such. Tree moderate grower; good bearer; fruit borne mostly solitary on long peduncle, running to good size under irrigation, early. This variety has gained a great reputation in Spain and America as a pickling olive, whether green or ripe, being of fine rich quality and losing its bitterness early. It is also valued for its oil. Strongly recommended for planting in the irrigation districts where pickling is in view.

Attica.—A variety not much grown, although rather good oil producer, about in the same class as Verdale as an oil olive, but said to produce a better quality oil.

Bouteillan—*Syn., Racimal, Boutiniere, Ribieu, Rapugette.*—Tree fairly good grower and cropper; said to be resistant to cold, and capable of doing well in poor soils. Fruit medium size, ripens somewhat unevenly, hangs well, unsuitable for pickles, but a useful kind for oil production.

Pigale—*Syn. Piqaou, Picatudo, Pognue, Pigau, Marbree, O. variegata, O. pignola, Tondolina*—Tree said to be a tall upright grower, doing well in poor soils. Fruit medium to above average size, mostly produced singly, oblong, deep-black when ripe, with white dots. A popular French variety, making a good oil, and in good quantities.

Dr. Fiaschi.—Small olive, unsuitable for pickling owing to size, but a useful variety for oil, although not regarded as first class.

Gros Redondau—*Syn., Gros Redona, Grosse Redouan.*—Tree a good grower, but shy though regular bearer. Fruit medium to large in good situations. May be used for pickling, but not recommended as an oil variety.

Arecluzzo.—Tree said to be a good grower. Fruit roundish ovate, medium size, borne in numbers on long pedicles with short peduncle; not recommended as a commercial variety for oil or pickles.

Atro-Rubens—*Syn.*, *Saillerne*, *Sagerne*, *Saverne*, *Salierne*, *O. rubro nigricans.*—Vigorous spreading tree and good cropper, rather susceptible to cold. Fruit rather small, deep-black, drooping, borne on long peduncle. Produces oil of good quality, but not in sufficiently large quantities to warrant planting for that purpose; unsuitable for pickles.

Macrocarpa.—Tree rather poor grower, and moderate to shy bearer. The fruit is very large and pointed; makes fairly good pickles, but of little use for oil.

Ammelau—*Syn.*, *Ammelau*, *Amandier*, *Amellon*, *Morcal*, *Madrileno*, *Maxima*, *O. amygdalina.*—Tree generally said to be weak grower, and not a good cropper. Fruit large, suitable for pickles, but a poor oil producer.

Salonica.—Tree considered to be only moderate grower, and shy bearer. Fruit medium size, roundish ovate; not regarded as a good kind commercially for either oil or pickles.

Columella—*Syn.*, *Loaime*, *Pasala*, *Columballa*, *Columbella.*—A very ancient kind. Free vigorous grower and good cropper. Fruit oval, of good and even size, borne in numbers generally on short pedicles. A thrifty kind, doing well in poor situations, but not regarded as a high-class kind for either oil or pickles, although, according to some American tests, a yield of 39 gallons to the ton of olives has been obtained.

Regati.—Tree moderate grower, with dense foliage and broad leaves, short petiole. Fruit roundish oval, below medium size. Insufficiently known to warrant recommending for planting for either oil or pickles.

Ragiola.—Tree said to be a moderate cropper. Fruit medium size, oblong oval in shape. Unsuitable variety for planting, either for oil or pickles, owing to poor oil content and lack of size.

Oblonga.—A variety about whose identity there appears to be a considerable amount of uncertainty. This kind was referred to before among those introduced to Dookie Agricultural College. It is found, however, that it differs from the Oblonga introduced into New South Wales. The name is one of the many adopted as a synonym for Picholine. The Racini or Radinoppe was introduced into California as Oblonga. But subsequently it appears that a variety under the name of Oblonga was introduced which differed in many respects from those previously mentioned. The kind introduced under this name to Dookie appears to possess many of the true characteristics of the Picholine.

Pendulina.—Tree moderate grower and good bearer. Fruit oval, generally medium, but variable in size; parts with its bitterness early, borne in numbers. This variety must not be confounded with Pendoulier, which was mentioned before in respect to Salouen, but is more generally known under the name of Corniale, a variety that has some value as a pickling olive, but not much esteemed for its recoverable oil content, although giving some excellent tests in Arizona, U.S.A.*

Belle di'Spagna—*Syn.*, *Belle d'Espagne.*—Fairly prolific kind, of medium size, but poor in oil content; not recommended for planting.

Columbaro.—Tree said to be fairly good grower and bearer. Fruit medium size, oblong, even shape. A variety of not sufficiently outstanding merit to warrant planting.

Cucco.—Medium to small olive, fairly good grower and cropper, varying somewhat in different soils. This variety has shown very high

* Bulletin 62, University of Arizona Agric. Ex. Station.

oil tests in California, but they are not supported by experiences here, nor yet does it appear to have gained any great popularity as an oil olive elsewhere. Unsuitable for pickles.

Lucca—*Syn., Lucques, Lucquoise, Oliverolle, Odorante; also believed to be identical with O. e. ceretocarpa.*—Fairly vigorous tree, of medium duration; stands frost well. Does best in deep, light, hillside situations. Produces a good quality oil, but not in great abundance. Esteemed chiefly as a pickling olive.

McArthur's Seedling.—This is a locally-raised variety, produced by McArthur Brothers, but not of sufficiently outstanding merit to warrant recommending.

Hardy's Mammoth—Variety raised by Mr. Thomas Hardy, South Australia. Tree good grower and cropper. Fruit very large in size, producing a good quantity of oil, also possessing many of the features of a good pickler, for which purpose it is specially suited. A useful kind, that promises to be of value for further planting.

Navadillo Blanco—*Syn., Doncel, Moradillo, Olivio Lucio, Ojiblanco, Argentata, Moureau, O. precox.*—Tree an exceedingly vigorous grower, of robust constitution. Generally regarded as a good bearer in suitable districts, but variable and less productive in regions unsuited to it. Subject to frost injury. This variety was planted largely in California, but has been superseded of late years by more desirable kinds.

Tarascon.—A variety of little vogue, being only of moderate value.

Sevillano—Syn., The Queen.—Believed by some writers to be identical with Regalis, Pruneau de Catignac, &c. An early Spanish sort, very large in size, bears mostly solitary. A popular kind for green commercial pickles, although somewhat coarse in quality. Clingstone, firm-fleshed, stands transport well. Some of this kind, with the Manzanillo variety, were recently introduced into this State from California by Mr. Elwood Mead. Recommended for planting where pickling is in view; unsuitable for oil.

Ascolano—An Italian variety, from Umbria. Tree a vigorous grower and good cropper. Fruit of large size, and of excellent flavour; an excellent kind for pickling, although bruising somewhat easily in transport, and not so suitable for long-distance transport as some other kinds; also does not colour well.

Rouget.—*Syn., Rougette, Marveilletto, Vermillau, Pigau, Laure, Caillose, Cayonne, Rousseoun, Rougeotte, O. rubicans, Rouget Cayonere.*—Tree hardy, erect, rapid grower, with large short leaves, petiole short and thick. Fruit red, medium size, borne two, three, or four together on long peduncle. Bears well, but not regarded as an high-class variety for either oil or pickles.

Oliviere—*Syn., Ouliviere, Oulliviere, Oullevieira, Pointue Pounchudo-barralenquo, Gallinenque, Atro-virens, Galinenquo, Liviere, Laurine, Michelenque, Bouteyenque, O. e. laurifolia, O. e. medio oblonga angulosa, O. e. fructu majusculo et oblonga.*—Hardy, vigorous tree, of great branching habit; long lived; does well in rich soil, bearing well nearly every year. Not suited for poor soils or dry situations, as it deteriorates greatly. Quality of oil varies much in different soils. Ripens in mid-season.

Oblitza.—Large roundish oval variety, resembling Pendoulier; tree generally good grower, hardy and productive, especially suited for pickling.

Razzo—*Syn., Frantojano.*—An olive that is grown largely in the regions of Tuscany and Lake Garda, Italy, and in the district of Lucca, where it is highly esteemed for its oil. Regarded as one of the very best oil producers in Italy. This reputation also appears to be supported by American experience. A prolific vigorous kind that seems to be well worthy of extensive planting, but as yet untried here.

Argentale—*Syn., Luzen, Veral Blanco, Blankette.*—A very large tree, of spreading habit; early. Oil said to be of good quality, but poor bearer.

Tagliasco.—Italian variety, known in France as Caillet or Cailletier.

Carrasqueno—*Syn., Redondillo, Redouan de Catignat.*—Early Spanish sort, of not outstanding merit.

Gordal—*Syn., Ocal, Oliro real, Hispalensis; probably same as Grosal.*—Large early Spanish variety, largely used for pickles.

Veral-negro—*Syn., Alameno.*—Appears to be identical with the French Callet Rouge, Tiganier, &c. Tree does not attain large size; bears freely and regularly. Fruit reddish, oval, of medium size. Makes a good quality oil, but not in large enough quantities.

Navidillo Negro.—A hardy Spanish variety, said to be prolific, and produce a good-quality oil. Late.

Javaluno.—A Spanish variety, said to produce large oval fruits. Ripens late; believed to produce good-quality oil, but more suited for pickling.

Bellotudo—Syn., Villotudo.—Early Spanish sort, said to be a large and luxuriant grower, but small bearer. Gives a good-quality oil, and matures early.

Empeltre.—Early Spanish sort, said to be small-growing tree, but very hardy, not susceptible to cold. A prolific bearer, producing a good oil.

Colchoundo.—A Spanish variety, said to produce large red roundish fruit about 1 inch long. Early, prolific, yielding a good quality of oil.

Lecciono—*Syn., Leccio, Lecinio.*—One of the most ancient varieties known. Believed to be the noted Licinian olive esteemed by Cato and his contemporaries. Remarkable for its great longevity and endurance to cold. The fruit, which is small, and produced in clusters, hangs well, and is borne in abundance. Said to produce a fine-quality oil in good quantities.

Puntarolo.—Said to be only moderate grower and poor oil-producer.

Mignolo—*Syn., Gremignolo.*—An Italian variety of great antiquity. Said to give abundant crops under conditions where many other varieties will not do at all. A free bloomer; the fruit is small, and hangs well. Fruits every year. Considered of great value in appreciating the value of poor hillside lands.

Morajolo.—A variety that appears to be much esteemed in Tuscany owing to its hardihood and prolificacy. Said to produce a good-quality oil in large quantities. Used largely in the colder situations, and on poor lands.

Morinello.—Another variety said to be much esteemed in Tuscany owing to its prolificacy and hardihood.

Trillo.—Tree said to be medium size, with broad leaves; a free bloomer and good setter; hangs well.

Blanquettier d'Antibes.—Tree vigorous, erect grower, chiefly confined to the neighbourhood of Antibes. Subject to frost injury. Said to yield an excellent oil, of very pale colour, which is much used in perfumery.

Moriale—*Syn.*, *Mourau*, *Moure*, *Mourescale*, *&c.*—Very large-growing tree, of spreading, almost weeping, habit. Regular bearer; very small early fruit; a variety that was much esteemed formerly.

(*Other varieties, as Rose*, *Ribeyro*, *Dragnignan*, *Arabane*, *Dent de verrat*, *Trippue* (*Syn.*, *Ventrue*), *although still retained in some places, are going out of date.*)

Naturally there are a great number of varieties in Italy other than those referred to in the foregoing pages. The reports of the Agricultural Department list over 300 kinds, but there may be a considerable amount of duplication owing to the number of synonyms used in some cases. Professor Antonio Aloi gives the following list as comprising the most fruitful kinds, as well as those that yield the best oil. They are grouped according to the different regions of the country.

Sicily.—Ogliaia, *Cattabellottese*, *Biancolilla*, *Calamignana*, *Nebba*, *Cerasola.*

Calabria.—Corniola, *Camaguana*, *Ottobraica*, *Coccitana*, *Mammolese*, *Varesano.*

Puglia.—Paesano, *Oglarolo*, *Monopolese*, *Cellina.*

Abruzzi.—Corniola, *Casertana*, *Noccia*, *Polyposa*, *Gentile.*

The Marshes and Umbria.—Raia, *Raggia*, *Corniola*, *Ascolona*, *Grassaia*, *Maglianese.*

Tuscany.—Frantoia, *Moraiola*, *Leccino*, *Correggiola*, *Razze*, *Marajole*, *Infrantoio.*

Liguria.—Taggiasca, *Pignola*, *Colombaia*, *Mortina.*

Lake Garda.—Nostrano, *Razzo*, *Gargna*, *Bomboletta*, *Favera.*

Other Italian varieties belonging chiefly to Sicily, Tuscany, and Puglia are:—Calabrese, *Patornese*, *Giarraffa*, *Pasole*, *Leccese*, *Siracusana*, *Pausio*, *Algiano*, *Sergio*, *Calaminio*, *Orchide*, *Regio*, *Coroite*, *Xreco*, *Mirteo*, *Biancolino*, *Pizzuto*, *Ferlese*, *Palazzuolo*, *Prunaro*, *and Dattio.*

In compiling a census of the most desirable olives some years ago, Professor Caruso, of the National University of Pisa, separated the olives under these heads, viz., the domestic olive, the wild olive, and the seedling olive. He groups the olives of France, Spain, and Italy in the following manner, relative to their value as oil olives:—

	Italy.	France.	Spain.
Group 1.—Oil Olives	Razzo	Olivier de Grasse	Cornicabra or Mission
	Trantojano ..	Plourour ..	.. .. ..
	Grossajo	Pendoulier ..	.. .. ..
	Correggiola ..	Pendulina ..	Royal or Gordal
	Taggiasco	.. .. ..	.. .. ..
	Racemi or Racinoppe	.. .. ..	Racimal
Group 2.—Middle class Olives ..	Morinello	Mouraou ..	Navadillo Blanco
	Morajolo	Cayou de Marseille	Veral Negro
	Piquolo	Picholine ..	Lechin

Olives of Italy, France, and Spain—*continued.*

—	Italy.	France.	Spain.
Group 3.—Seedling Olives	Mignolo	.. .. ..	Manzanillo
	Germiquolo ..	.. .. ..	.. .. ..
	Leccino	.. .. ..	.. .. ..
	Leccio	Verdale	Empeltre
	Columbaro ..	.. .. ..	Verdejo
	Puntarolo	.. .. ..	.. .. ..
	Trillo	.. .. ..	.. .. ..
Group 4. — Wild Olives	Oleastro	.. .. ..	Acebuche

(*To be continued.*)

THOMAS' PHOSPHATE (BASIC SLAG).

"The lime contained in basic slag, *i.e.*, Thomas' or Star phosphate, is itself of considerable value; it supplies what is often a much-needed base, and on old grass land in particular, its effect in bringing the soil potash into solution, and in promoting the oxidation of the nitrogenous reserves in the soil is very marked; on tillage land also, the lime is of assistance in improving the texture of the soil."

—A. D. HALL, M.A., F.R.S., formerly Director, Rothamsted.

"In this country (England) there is rather a prejudice against the use of basic slag on the lighter soils—the sands and gravels, which are yet too poor in carbonate of lime, to be fitted for superphosphate.

They are generally regarded as too dry to allow the basic slag to be effective, but in view of the value that basic slag has been found to possess on the light sandy soils of Eastern Germany, where, too, the rainfall is less than that of England, the popular opinion seems to be founded on a misapprehension. It has probably arisen from the fact that on the poor, sandy grass pastures (where lacking the necessary potash), basic slag never (when applied by itself) shows the extraordinary effect it does on the poor clay pastures. This is due, not to the ineffectiveness of the phosphoric acid in the basic slag, but to the lack in the sandy soil of both potash and of humus to be set in action by the lime contributed by the basic slag. The great outburst of white clover, which often follows the application of basic slag to a clay pasture, is mainly promoted by the potash liberated from the soil. As a source of phosphoric acid for tillage land, basic slag is probably little less effective on a light than a heavy soil."

FEED AND COWS' MILK.

In his quarterly report upon the analysis of various samples taken under the Food and Drugs Act, Mr. Arthur Angell, public analyst of the Hants County Council, says that there appears to be a growing practice of feeding cows upon brewers' grain and oil cake, by which milk rich in fat and poor in other ingredients is produced.—*Fertilisers and Feeding Stuffs Press*, 21st November, 1914.

SEEDING NOTES.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

It is unfortunate that, coincident with the progress of the greatest war in history, the most severe drought on record should be afflicting Southern Australia. So far from being in a position to make a material contribution of grain for the Empire's needs, Australia will need to import wheat before the close of 1915 to supply local shortage. The effect of the drought has not only been felt on the wheat crop; equally serious has been its effects on grass, fodder crops, hay, water supplies, and water storage. Never has the wheat farmer been more anxious to see a decided break in the weather as in the past six months. With pastures denuded of grass, dams drying up, dwindling forage supplies, and drifting fallows, the task of the farmer has been anything but enviable.

Victoria has not suffered as badly as other States, for it has been possible to transfer the greater portion of the stock of the worst affected districts to the Western District and Gippsland, where, despite a shortage in the rainfall, grass has hitherto been plentiful. In this way loss of stock, which is the worst feature of droughts, has to a large extent been mitigated.

It seems fairly certain that the acreage sown this season will not be as large as was anticipated last harvest. The factors which are most likely to exercise a limiting effect on the acreage sown to wheat in the wheat belt will be shortage of grass and fodder, scarcity of water, and inability to effectively use the normal team strength for the preparation of the crop. At the present time (15th March), a large percentage of the horses of the Mallee, Wimmera, and Northern Districts are in Gippsland and the Western District on agistment. Of the number that remain on the wheat farms, many are engaged in carting fodder and water, whereas in a normal season they would be engaged in preparing the land for seeding. There seems good ground for believing from the many inquiries received by the Department that considerable areas of wheat will be sown this year in Gippsland, the North-Eastern Hill country and in parts of the Western District where hitherto wheat has not generally been grown. This is satisfactory, and if care be taken to secure varieties which are suitable to such districts, good returns may confidently be anticipated.

The abnormal prices ruling for hay and fodder, caused by the excessive demand from South Australia and North-Western Victoria, will debar many who are short of feed from putting in increased areas. Nevertheless, with a definite break in the weather, and good April rains, grass and herbage will spring up with remarkable rapidity, after the prolonged and enforced rest the land has had through the visitation of drought.

In view of the abnormal circumstances surrounding the present season, some observations on seeding practices should be of interest.

PROVISION FOR EARLY FORAGES.

In view of the bare condition of pastures, and the scarcity of feed in the wheat areas, opportunity should be taken to sow, as soon as possible,

and before the rain comes, small areas of Cape Barley, Algerian Oats, and Winter Rye for early green feed for the stock. In the better rainfall districts, sowings of rape, and rape and barley will give a profusion of feed soon after the first heavy downpour of rain.

Practically all the stock in the wheat areas are now being hand-fed at considerable expense, and a small expenditure on early-sown green forages will reduce working expenses, and the condition of the stock will be materially benefited.

ECONOMY OF SEED.

The figures published by the Prices of Goods Board giving the supplies of wheat on hand in Victoria on 25th February show that the quantity of wheat available for seed purposes is below probable seeding requirements. If a full acreage is to be seeded, therefore, it is very desirable that the greatest possible economy of seed should be effected, consistent, of course, with crop efficiency.

It is well, therefore, to consider, in view of the high price of seed wheat, and its general scarcity, whether smaller sowings per acre than are usual would be advisable, in view of present circumstances, and the nature of the past season.

Principles Governing Rate of Seeding.

In order to appreciate the problem and to find an answer, consider what are the factors which govern the amount of seed sown per acre. Briefly, we may say that the amount of seed required varies with the rainfall of the district, the time of sowing of the seed, the character of the seed bed, the class of wheat used for seed, and the depth and condition of the soil in which the seed is sown. Let us consider these various points, and then endeavour to see how we may adapt the principles involved to local practice. The lower the average rainfall the less seed is required. The minimum is therefore required in the Mallee, the maximum in the Western District, the North-East, and in Gippsland.

The time of sowing is important. Early-sown wheat requires far less seed than the same variety sown late. This has been demonstrated year after year in the results of experimental plots at experiment farms. Forty pounds of seed sown in April in a normal season will give as thick a crop as 60 to 70 lbs. of seed sown in June. That is one reason why as seeding progresses it is necessary to gradually increase the amount sown, since the late-sown wheat has much less opportunity to stool out and establish itself before the winter sets in than the early-sown wheat. Soil temperature is an important factor in determining the extent and nature of stooling. In April the moisture and warmth enables vigorous growth to take place and vigorous stooling results. In June the soil temperatures are falling rapidly towards the minimum required for germination and active plant growth, consequently some of the seed fails to germinate, and what does germinate, does not stool readily.

The character and tilth of the seed bed is obviously important. A rough open tilth will need a much heavier seeding than a fine, firm consolidated tilth. Air spaces and hollows in the seed bed are great enemies to young germinating wheat plants. It is not necessary that the surface tilth for wheat should be like an onion bed. Indeed, such fine tilth may be detrimental in bringing about premature caking and crusting of the surface. But it is essential that the under portion of

the furrow slice should be fine and firm, though the surface may be cloddy. Early sowing on clean land in good tilth requires the minimum seeding, and the better the tilth the less the seed required.

The variety and character of the wheat should be taken into consideration. Some varieties, like Bunyip, Hugenot, and Clubhead, are poor stoolers, and need heavier seeding; whilst Federation, Jade, Genoa, are good stoolers. Small-berried wheats, like Comeback and Bobs, need lighter sowing than large-berried varieties like Hugenot, King's Early, and Gluyas.

Finally, the depth of sowing and the mode of pickling the seed for smut have an important influence on the germination of the seed. The deeper the seed is sown, especially in clay soils, the lower the percentage of germination.

In an interesting series of investigations extending over a period of three years, Professor Perkins, of South Australia, found that in heavy clay loam soils—

(*a*) Seed placed 1 inch deep gives the best percentage of successful germination.

(*b*) Germination continues to be satisfactory to a depth of $2\frac{1}{2}$ inches.

(*c*) The percentage of germination falls off as the depth of sowing increases, and at $4\frac{1}{2}$ inches over 50 per cent. of the seed is lost.

Quantities of Seed to Sow.

Taking all these factors into consideration, we may say that the rate of seeding for the Mallee ranges from 35 to 60 lbs. per acre. In the Wimmera and Goulburn Valley, 50 to 75 lbs. is the normal seeding, whilst in the North-East and Western Districts, from 65 to 90 lbs. is customary. For hay crops, 15 per cent. to 20 per cent. heavier seedings should be used than for grain crops.

The farmer needs to use judgment as to whether the minimum, the mean, or the maximum for his district should be sown, by considering all the points enumerated above. With early sowing, at shallow depths, on well-tilled land, and with good stooling varieties of wheat, the minimum sowings may safely be used. As the seeding advances, and soil temperatures fall towards the minimum for successful germination (41 degrees Fahr.) the higher limits of seeding must be used, and very late seeding requires the maximum quantities.

What seeding may be given to that large area of worked-up land which failed to mature a crop last season, and which therefore is really a two-year fallow? In view of the fine tilth, and the enforced rest, and the absence of weeds, these lands should mostly be in excellent condition and well consolidated, and the minimum seedings above specified may safely be reduced by 5 to 10 lbs. this season. For, if April and May rains are at all copious, the stooling and germination should be unusually good on these enforced fallows.

In view of the high price of wheat, and the scarcity of good local seed, many farmers have been compelled to use seed for wheat purposes which in good seasons they would probably hesitate to sow. Smut was fairly prevalent in the Western District last season, and much of the previous harvest (1913) was affected with smut. This may be seen from the number of bags of smutty seed found and rejected among the 410,000

bushels of seed purchased by the Department of Agriculture for distressed settlers.

Pickling the Seed.

Care should be taken, therefore, to see that clean seed is sown, or if seed slightly smutted has to be sown, particular care should be exercised in pickling the seed. As is well known, both bluestone and formalin interfere with and delay the germination of the seed. The amount of grain actually killed in the process of pickling depends on the strength of the pickling solution, the mode of pickling, and the condition of the soil in which the pickled grain is sown. This subject was discussed fully in " Wheat and Its Cultivation " (Bulletin 22, issued by this Department), and it is unnecessary, therefore, to refer to the matter in detail. But it may be said here that, if the seed is at all smutty, and bunt balls are present, bluestone should be used rather than formalin, as the latter has little power to prevent re-infection of the grain, though it is quite efficacious in killing all spores attached to the grain. Moreover, in such cases, the grain is best pickled by immersing the seed in a 2 per cent. solution of bluestone (2 lbs. bluestone in 10 gallons of water) for three to five minutes, and in such a way as to cause all bunt balls to float to the surface of the pickle, where they can be skimmed off. If these bunt balls, whose hard, impermeable coats protect the myriads of smut spores within from the pickle, are not removed, they are liable to be broken in passing through the force feed attachment of the drill, thus liberating the enclosed spores and bringing about re-infection of the seed.

Pickling by Immersion.

Several cheap patent pickling devices based on the immersion principle are now on the market. A common principle adopted is to use a wooden receptacle, such as a cask for containing the pickling solution, a perforated copper vessel to hold the wheat, and a pulley and tackle to haul the wheat in and out of the solution. The wheat is poured from a bag in a stream into a perforated copper vessel immersed in the bluestone. Any bunt balls immediately get separated from the stream of wheat, and float to the surface of the pickle, whence they are removed by skimming. After immersion for the requisite period, the vessel of wheat is hauled by a pulley out of the pickle, allowed to drain, and then swung round over the mouth of a bag. The false bottom of the vessel is then unfastened, and the wheat drops in a mass into the bag.

If the seed appears quite free from smut, or is known to have been produced from clean paddocks, a much weaker pickling solution may be used. In this case, 1 per cent. solution of bluestone (1 lb. bluestone to 10 gallons of water), or a solution of formalin 1 in 500 (1 lb. of Formalin to 50 gallons of water) would be strong enough. A more satisfactory germination would result, and the young growth would come away quicker than with the stronger pickling solution.

Necessity for Cultivation.

The cultivation of the soil preparatory to seeding needs careful attention. The practical absence of spring, summer, and autumn rains, has prevented ordinary fallow land being brought into that condition of tilth usually found at this time of the year. Rain is an important

factor in tilth production, and its absence for the past nine months will result in hollow, cloddy seed beds, and great care will be necessary in bringing these into a condition suitable for sowing.

On the other hand, most of the worked-up stunted crop lands are in excellent condition—practically equal to a two years' fallow—and seeding operations could therefore begin on these, leaving the ordinary fallow and stubble ploughed land to mellow down with the first rains.

Varieties to Sow.

Many farmers make it a regular practice to sow three or four varieties of wheat. This is commendable, for it avoids the risk of having all the farm eggs in the one basket, though it slightly increases the work at seeding and harvest time.

There is now a very wide selection of varieties available for farmers, and the difficulty often is to know exactly what to sow. Varieties like Federation find a place on nearly every farm, and in some districts Federation practically monopolizes the area. An interesting example of this was noted at Minyip this season. In sorting out and classifying a line of wheat bought by the Department of Agriculture, of 22,816 bags, and stacked on the Minyip station, no fewer than 21,005 bags, or over 92 per cent., was Federation.

In the Mallee districts, especially the new districts, Federation is not so popular, on account of the shortness of its straw, and its susceptibility to fungus diseases. Varieties like Mac's White, Dart's Imperial, Gluyas, Viking, and King's Early, are widely grown. In the Wimmera and Northern Districts, however, Federation holds pride of place, though considerable areas of Yandilla King and Dart's Imperial, are grown. Varieties like Currawa and Penny are likely to be of use in these districts. In the North-East and Western Districts, where the growing period is longer, Marshall's No. 3, Yandilla King, Penny, and American No. 8 are useful varieties to grow.

In sowing these wheats, care should be taken to sow the late-maturing, slow-growing types, like Marshall's No. 3 and Yandilla King, first; and quick-growing, early-maturing types, like King's Early, Bunyip, and Gluyas, last. It is necessary to emphasize this fact, as it may be supposed that the "early varieties" should be sown early, and "late varieties" should be sown late. In practice, however, the exact opposite is the case.

Dry Sowing.

So far as the time of sowing is concerned, the conditions at the present time (15th March) are such as to render early sowing fairly safe—certainly much safer than at the corresponding periods of the three previous years.

Oats and barley may certainly be sown with little risk, for the husk of these seeds acts as a natural protection against malting. Whether the farmer should commence seeding his wheat, or wait for substantial rains, depends on what acreage he has to sow, the team strength available for the purpose, the condition of the fallows, and the quantity of fodder on hand or in sight. Those who are at present feeding their teams on high-priced chaff purchased from the city, will probably decide to go straight on with the seeding, and take the risk of the seed malting. As mentioned above, the risk of malting will be, not in the condition

of the soil, but in the nature of the subsequent rains. The soil is dry enough in most districts to make dry seeding quite safe. The only danger lies in patchy isolated showers, followed by a burst of drying weather.

Those who have good supplies of fodder, adequate team strength, and their cultivation well in hand, will naturally prefer to wait till rain gives them an opportunity of putting the seed in under the most favorable conditions. Seed is safer in the barns than in a dry seed bed.

MANURIAL PROBLEMS.

An interesting problem at the present is the determination of the quantity of manure to be sown this year. It is of especial interest in view of the fact that a large proportion of the area seeded in 1914 failed to reach maturity, and the question arises as to whether the super applied last year is still in the soil, and still in the same form as it was applied. Much difference of opinion exists among farmers as to whether the land that received a dressing of manure last year, but, through drought, failed to produce a crop, should receive a dressing of super again this year; and, if so, whether a partial or a full allowance of fertilizer should be sown. To settle this matter, a few facts concerning the action of superphosphate on the soil are worthy of notice.

What Happens to Superphosphate.

In the first place, it must be remembered that if 60 lbs. of superphosphate were applied with the seed last year, that 60 lbs. will not be present in the soil now in its original form. If a crop failed, through drought, to materialize, the phosphoric acid, which is the active and important constituent in superphosphate, will have almost completely changed into other forms, which are less available than the phosphoric acid in freshly-applied super. When phosphoric acid is applied to a soil in the form of super several important changes take place in its mechanical condition and chemical composition. The phosphoric acid, which is present in a form known as water soluble phosphate (monocalcic phosphate of lime), becomes more or less completely dissolved in the soil moisture and the early rains. It thus assumes the same mechanical condition as sugar or salt when dissolved in water—that is, it becomes divided up into infinitely small particles—particles much finer than you could get by any known process of mechanical grinding. In this infinitely minute form, it gets diffused right throughout the soil by capillary action.

But changes are rapidly going on in the composition of the phosphate. As it moves through the soil in solution it comes into contact with lime, iron, alumina, and other soil bases, and gradually it gets converted into a form of "reverted phosphate," or "citrate soluble phosphate," whilst a smaller portion gets converted a stage further into insoluble phosphate. At what rate does this reversion go on? Experiments were commenced some months ago in the departmental laboratory to find out the rate of reversion of superphosphate when applied to Werribee, Rutherglen, and Longerenong soils, and whilst these investigations are still in progress, the results obtained by Messrs. Scott and Robertson indicate that the rate of reversion in all cases is relatively rapid, and that approximately one-half of the super is reverted within two weeks of application. Why, then, it may be asked, is super so

superior in its action to the less soluble phosphates—basic slag, bonedust, and rock phosphate?

The question, indeed, is very pertinent. Owing to the solubility of the phosphoric acid in super it gets immediately dissolved in the rain and soil water. In this form, its particles are infinitely small. In this infinitely minute form the solution of phosphoric acid coats every soil particle in the neighbourhood of the roots, and then gradually gets converted into the reverted form at the surface of each soil particle. It is this fineness of subdivision of the phosphate, and its infinite diffusion through the soil, that make its action superior to basic slag and other phosphates.

A second fact of importance regarding superphosphates is that the extent of the reversion depends on the time elapsing since its application. Preliminary experiments on Werribee soils have shown that, at the end of two weeks, 54.3 per cent. of the phosphoric acid in superphosphate was reverted to the citrate soluble state, and 32.5 per cent. converted into an insoluble form, whilst 13.2 per cent. was still in its original water soluble condition. At the end of twelve months it might be expected that the whole of the super would be converted into reverted phosphate and insoluble phosphate.

Effect of Super on the Young Crop.

Now, one of the most important influences exerted by super is its effect on the young root system. It acts as a crop starter, giving the crop power to make very vigorous early growth. Phosphoric acid is the soil's most deficient constituent. Unless, therefore, the young crops can secure liberal amounts of available phosphate in the early stages, the early growth is stunted.

It is a matter of common observation that early sown crops do best in the majority of seasons. They get their roots well down into the warmer subsoil before the cold snaps of winter come on. They are thus able to grow and stool vigorously when late crops are germinating with difficulty in the colder surface layers. They appear to grow and develop when the late sown crops are stationary, and the well-developed root system ramifying in the warm under subsoil keeps the overhead portion supplied with the wherewithal to keep going. Super applied with the seed has a similar effect. The young plants find the phosphoric acid quickly; they develop rapidly; and the roots find balanced quantities of water soluble and citrate soluble phosphates as they develop. It is this initial "kick-off" that the super gives to a plant that enables a supered plot to excel any other phosphatic dressing in harvest results. It stimulates root development, and encourages, and, indeed, makes possible, vigorous stooling. The vigour of growth is ever governed by the actual amount of the most deficient plant food present. Let water soluble phosphate be absent at the critical stage of a young plant's career, and its development will be retarded, and its ultimate yield reduced. What, then, is the bearing of these facts on the present problem?

It seems clear that land which received a dressing of super last season will require another application this year. The water soluble phosphate of the super applied last year has been mostly converted into less soluble forms. Certainly very little, if any, will be left in its original water soluble condition. Consequently, dressings of super should be given with the seed this year in order to have the essential soluble phosphate in the critical sphere of root development during the early stages of growth.

Rate of Application.

Should a full dressing be applied? This is unnecessary, for a considerable portion still remains in the soil as citrate soluble phosphate, and sufficient super. should be applied to give the plant the vigorous start essential for success. For these lands, therefore, a dressing of two-thirds to three-quarters of the normal dressing is recommended.

The non-manuring of these lands is to be strongly deprecated.

What should the normal fallow receive? So far as the lands fallowed up last winter and spring are concerned, it must be borne in mind that, in the absence of soil moisture from the fallows due to the prolonged drought, the formation of soluble phosphates from the insoluble reserves of the soil will not have proceeded at a normal rate. The amount so formed this summer will certainly be less than that formed in a normal season, consequently, the shortage must be made good by increased applications of artificial manure if the fullest benefit of the rainfall is to be obtained. If, as might reasonably be expected from previous droughts, the winter rainfall is heavy in 1915, the crop will be able to reap the full advantage of a heavier dressing. In this connexion, the results obtained from moderately heavy dressings of super., as compared with light dressings, even in dry seasons, are worth studying. These are given in detail in "Results of Field Plots" in this issue.

Every advantage should be taken to secure as high a gross and net return per acre as possible. With the prospective high prices for wheat, liberal manuring offers the farmer a sure and effective means of increasing his profits.

Summing up, we may say:—

(1) Worked-up stunted crop lands should certainly receive an allowance of superphosphate—and two-thirds of a normal allowance is recommended.

(2) Ordinary fallows, and autumn-ploughed grass lands, should at least receive a normal application, and there is every advantage, and little risk, in increasing by 20 to 25 per cent. the quantity of super. ordinarily sown.

Seed Wheat Supplies.

During the past four months, the Department of Agriculture has purchased, sorted, and classified 410,000 bushels of seed wheat for distribution among distressed settlers. Of this, 120,000 bushels of named varieties were purchased from farmers from the new season's crop, and this has already been distributed (15th March) among holders of Government orders. The balance of the stocks on hand represents wheat of the 1913 crop purchased on country railway stations, and this has since been classified into varieties, and is now in process of distribution. The stocks on hand are sufficient to supply every outstanding Government order for seed, and leave a fair quantity for those who have not yet been able to secure seed.

The Government, through the Seed Wheat Boards and Mallee Relief Boards, has approved to date of advances to the extent of £413,558 for relief of settlers, of which approximately £220,000 represents advances for seed wheat, and the balance represents advances for fodder and seed oats.

The timely distribution of this relief has enabled the farmers in the drought-stricken districts to carry on their work, and make provision for the seeding of their holdings.

THE MAIZE-PRODUCING INDUSTRY IN VICTORIA.

By Temple A. J. Smith, Chief Field Officer.

(Continued from page 137.)

History.

Various attempts have been made by investigators to discover the original home of the maize plant, but so far as can be ascertained Southern Mexico appears to have been settled as the most probable source. As far back as 700 A.D. it is said to have been grown at Rio Grande, and in 1492, when Columbus discovered America, maize was generally cultivated. It was then introduced to the world, receiving various names in different countries, and rapidly came into favor, until at the present time it is one of the most valuable crops of commerce.

Maize belongs to the Gramineæ, or grass family, in common with other cereals, and is divided into several groups, namely:—

Order—Gramineæ.
Tribe—Maydeæ.
Genus—Zea.
Species—Mays.

These, again, are divided into sub-species or types as follows:—

I. Dent maize (*Zea Indentata*).—There are a number of varieties of this type showing considerable variation: it is, however, a large type, requiring a long period in which to mature. The horny endosperm is located at the edges of the kernel, and the soft endosperm in the centre of the outside end of the grain. As the cob ripens this softer material shrinks, causing a depression or dent in the seed which gives rise to the name. The ears have a large number of rows of grain, the latter being long wedge-shaped and closely packed. The cobs are thick in proportion to length.

Dent maize grown under suitable conditions is, as a rule, one of the heaviest yielders.

II. Flint maize (*Zea indurata*).—Has a round hard tip to the grain owing to the soft endosperm being nearer the centre of the grain with the hard endosperm on the outside. There is consequently no indentation, and the shrinkage is uniform.

Both stalks and cobs are smaller than is the case with Dent varieties, the latter being narrow and long in proportion. The number of rows of grain are fewer and the seed somewhat loosely set. This type is quicker in maturing than the Dent, and is consequently better suited with a shorter season.

III. Soft maize (*Zea amylacea*) is a broad, round type, the interior of the grain being composed of a soft starchy endosperm with little horn. The ear is somewhat short and thick, the shape of the grain being round and large, with little or no indentation. This maize requires a long season in which to mature, and is useful for silage purposes or green fodder.

IV. Sweet maize (*Zea saccharata*).—Has a translucent horny appearance of the endosperm, and wrinkled kernel when matured, the starch is largely reduced to sugar, the ears are small, and the grain broad and rounded.

Different varieties require different lengths of time to mature. It is useful for table use and silage.

V. Pop corn (*Zea everata*).—Has a very horny endosperm, which, when subjected to heat, turns inside out, exposing an enlarged white mass. There are two families, known as rice and pearl. The cobs are small and plentiful. This maize is only grown for human consumption.

Brewer's Yellow Dent Variety Maize, grown on Mr. J. Gilbert's Farm, Orbost.

There are several other types which are not of practical value, and need not be dealt with here. Of those mentioned the Dent and Flint types are most in favour for grain, the sweet maize and popcorn being grown to a very limited extent.

Varieties.

There are at least 1,000 varieties of maize, which can be accounted for by the fact that the plant is easily cross-fertilized, and also that its characteristics are soon altered by the influences of soil and climate to which maize will, up to a certain point, adapt itself.

The red, or yellow varieties have been the most popular in Victoria, though the white varieties have proved prolific. Apparently buyers prefer coloured maize, and growers cater for them in this respect, notwithstanding the fact that the feeding value in both is practically the same. The intending grower should be careful to suit his variety to the soil and climate in which he operates. There is a considerable risk in growing a slow maturing maize where early frosts are liable to occur, and even if no frosts appear cool weather, about the filling stage of the cob, will have a bad effect on the yield. At the same time, to grow early maturing varieties where the season is long, is to limit production, for the reason that the slower maturing varieties are invariably the heavier yielders. It is found also that some maize is better suited to heavy soils than others.

Where the season is long, but the latter half is generally dry, early varieties, or medium early varieties, are likely to prove most profitable, consequently the grower should exercise careful judgment in selecting maize for his own special conditions. The following description of a few of the best-known varieties may be of assistance to beginners:—

Funk's Yellow (Dent).—This variety is grown at Orbost, Cann River, and Bruthen, and is popular in most of the coastal districts. It has a pale-yellow colour, the cobs measuring 9 to 12 inches in length and 7 to 8 inches in circumference. The ears are slightly tapering, and the indentation slightly rough. The grain is deep and the tips well filled, the butts being well rounded. It is a fairly late maturing variety, and yields well.

Sibley, a rather early maturing yellow maize, fair yielder, looked upon as very safe and a favourite in Gippsland.

Longfellow (Flint).—In shape is slightly tapering, 10 to 12 inches in length and 5 inches in circumference; the grain is firm on the cob, medium yellow in colour, with no indentation; the shape of the seed is broad and wedged; the space between the rows is wide, and the number of rows ten to twelve. The butts fill well, and the tips fairly well; the colour of the cob is white; the percentage of grain to cob being small, medium early.

Reid's Yellow (Dent).—Is likely to become a favourite, is medium late, ears 9 to 11 inches long and 7 inches in circumference, with eighteen to twenty rows of grain, colour medium dark-yellow with a tinge of red, compact on the cob; the kernels are narrow and thick; the butts and tips well covered; the shank small, suits rich soil or medium soils, and should do well inland.

Leeming (Dent).—Medium early; adaptable to climate; ears tapering and closely filled, short, gives a high percentage of grain to cob; colour light-red, cobs well covered with husk. One of the best varieties grown inland for fodder purposes, keeping green well into the autumn, with a medium heavy stalk and good leaf.

Eclipse, same as Leeming; can be planted very late for silage.

Hickory King.—White maize; a fair grain yielder, small ear with few rows of large broad smooth grain; late in maturing. A favourite fodder maize, growing plenty of foliage with soft stem.

Boone's County White.—Medium early variety; very large ear, cream colour, fills well; indentation rather rough; short husks; grain long; useful for grain or fodder.

Sibley Variety Maize, grown on Mr. E. Waller's Farm, Orbost. Estimated to Yield 100 Bushels to the Acre.

Yellow Moruya.—A fine fodder maize, large yielder, grain large flat, rounded, yellow; late maturing.

Ninety Day.—Early maturing; short stalk; light yielder; very little grown at present.

Silvermine.—Colour, dull white; shape cylindrical, with tapering tip, large circumference in proportion to length; big space between rows; grain broad; indentation rough; percentage of grain large; medium early in maturing; good husk; suitable for medium soils.

Brewer's Yellow Dent.—A good all-round variety, fairly early ripener, and good yielder. Its chief characteristic being the ripening of the ear while the stalk is still green. It can be harvested for grain, and the stalk afterwards turned into silage and fed as green fodder; said to be the heaviest yielding early variety known; has abundant green leaves, the ears containing twenty-two rows, with fifty kernels in each row.

James's Yellow Dent (introduced by Mr. H. James, of Orbost).—A good early, heavy-yielding maize, said to be an improvement on Funk's Yellow Dent.

Corn planter.—Very similar to Boone's County White; heavy yielder.

Minnesota No. 13 (lately introduced by Mr. James).—Rather small ear, very well filled, with a beautifully shaped kernel of bright colour. good yielder, acclimatised two years, and likely to become popular.

There is a good prospect before growers to specialize in pure seed maize production, as there is a constant demand for the pure article at high prices. Maize is, however, easily cross-fertilized, and it is only in isolated or specially-protected places that such operations can be successfully adopted. There are, however, many such places situated in creek valleys and the upper reaches of our rivers admirably adapted for such work. No other maize should be grown within at least a mile of such plots, as the pollen may easily be carried or blown that distance, and the seed become infected.

One variety only should be used, and that one chosen from those most suited to the environment and requirements of similar districts. A system of seed selection should also be adopted at the same time, in order to still further improve the general qualities of the crop, and add to the yield.

Work of this description is being done by a very few farmers in Victoria, and the importance of such methods can hardly be exaggerated. The effect on the whole yield for the State could be increased, and incidentally the profits to each individual grower.

CLIMATIC INFLUENCE.

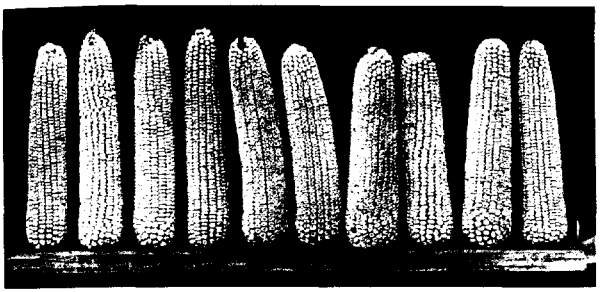
Maize takes from three to six months to mature, according to the varieties used and the conditions under which it is grown. A heavy frost after germination or before the ripening stage is reached, is liable to destroy the crop; therefore, to be reasonably safe, maize must be grown where in normal seasons frosts are absent during the growing period. Other elemental factors are sunshine, humidity, rainfall, and wind. Sunshine provides the required energy for the activity of plant growth, and with maize particularly has the effect of preventing disease, and supplying the warmth required to ripen the crop. Humidity of atmosphere is not actually indispensable for maize where a sufficient amount of artificial water can be supplied, but growing under natural conditions is always desirable.

Rainfall to a sufficient extent during the summer months is essential where irrigation is not practised, with judicious cultivation less rain can be made efficient than would otherwise be the case. The regularity or uncertainty of the rainfall also influences the crop materially.

Best Six Green Stalks and Cobs, Orbost Show, 1915. 13 Feet High.

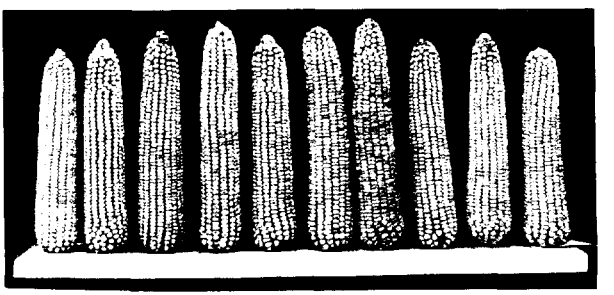
Montgomery estimates that the transpiration of 14 to 20 tons of water is necessary for the production of a bushel of maize; therefore, for a 50-bushel crop, 7 to 10 acre inches would be required, and in proportion for larger crops, allowing for loss due to drainage and

evaporation not less than 12 inches should be necessary. There will be also some variation in regard to the soil, some having a greater moisture-holding capacity than others. A fairly-evenly distributed rainfall is naturally best, but perhaps the most valuable fall is that which occurs just after the grain has started to form. That also is the time when maize grown under irrigation should receive its last good watering.



First Prize Maize Cobs, Orbost Show, 1915.

Wind.—Hot, drying winds are highly detrimental to maize, checking the growth, and in some cases blowing the maize down. Situations where the natural rainfall can be supplemented by irrigation are especially good, and there are many such in Victoria where maize could be made a profitable crop.



Second Prize Maize Cobs, Orbost Show, 1915.

The length of season greatly affects the yield of the crop, the slower maturing varieties being the heaviest yielders, excepting where the absence of rain or irrigation is felt in the later stages of growth.

For fodder maize, which does not involve the maturing of grain, colder and shorter seasons will suffice, the main requisites being a suitable soil and sufficiency of rain or water.

SOIL.

Maize likes a warm, deep, friable soil, in which good drainage is essential, with a fair capacity for holding moisture. Alluvial flats of good quality are possibly the best, though rich upland soils also produce good crops.

Poor land deficient in humus is not suitable, and will not grow maize for grain, though if well-treated may be utilized to produce fodder crops. Heavy stiff soils and sour soils are undesirable, a plentiful supply of nitrogen being necessary, and such soils do not lend themselves sufficiently to nitrification. The flats along the Snowy River and Tambo are probably as good as any in the world for maize production, crop after crop for over thirty years has been taken off, and yet the yields do not diminish. This is due largely to their being silted up every year by floods which bring down *débris* from the hills, leaving deposits inches deep of rich material, which constantly renews the land. Manures are not used, neither is any rotation system in vogue. Other districts are not so fortunate, and proper systems of manuring and rotation cropping would greatly increase the profits.

Maize has deep-rooting habits, consequently a free, friable soil is good; the roots require air and warmth, which such soils provide, in addition to good drainage. Free, sandy loams of good depth, rich, friable clay loams, and good chocolate volcanic soils, are all suitable where situated in warm districts, with sufficient rainfall.

Preparation of the Soil.—Much of the success attendant on the growth of maize is due to a thorough preparation of the land. Virgin soils often produce good maize crops for the first couple of years, and afterwards refuse to give profitable returns. This is often caused by bad cultivation, want of rotation systems, and manures.

Maize is a large nitrogen feeder, and this element of plant-food can be considerably augmented by fallowing. Wherever possible, land should be ploughed as deeply as the surface soil will permit in the early autumn, 8 inches to 9 inches in ordinary soils, and where heavy clay soils are worked, if the surface soil is not sufficiently deep to allow of this practice, a lesser depth of ploughing followed by subsoiling is advisable. The effect of an early fallow is to increase nitrification enormously, as is shown by the tests conducted on Longerenong Government Farm, which are quoted below—with comments by Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, as follow:—

"From the table it will be seen that the amount of nitrate in the fallowed land gradually rose from 59½ lbs. in December, to 118.3 lbs. in the first week in February, after which it gradually fell to 91.87 lbs. per acre, as contrasted with 21 lbs. in the non-fallowed portion. As a 15-bushel wheat crop removes in its grain and straw about 21 lbs. of nitrogen per acre, it will be observed that there was four and a half times more available nitrogen in the fallowed portion at seed time than was required for a 15-bushel crop.

On the other hand, in the non-fallowed portion there was barely enough nitrogen to supply the requirements of one such crop even assuming that every particle of nitrate nitrogen in the first 5 feet could have been used by the crop.

Moreover, at seed time, the nitrate nitrogen in the fallowed land amounted to 71 lbs. per acre above that of the non-fallowed portion.

If nitrate of soda containing 15 per cent. of nitrogen be worth 14s. per cwt., then the cash value of this extra nitrate content of the fallowed land over that of the unfallowed portion amounted to no less than £2 19s. 2d. per acre."

Total Nitrate Nitrogen in the first five feet of Fallowed and Non-fallowed Land under Ordinary Field Conditions at Longerenong (Victoria), 1912.

Date of Sampling.	Amount of Nitrate Nitrogen. (In Parts per Million.)		Amount of Nitrogen. (Reduced to lbs. per Acre.)	
	Fallowed.	Non-fallowed.	Fallowed.	Non-fallowed.
			lbs. per acre.	lbs. per acre.
(1) 7th December, 1911 ..	3·4	Not taken	59·5	Not taken
(2) 4th January, 1912 ..	4·6	2·18	80·5	38·15
(3) 6th February, 1912 ..	6·76	1·10	118·3	19·25
(4) 28th March, 1912 ..	6·00	1·94	105·0	33·9
(5) 20th May, 1912 ..	5·25	1·20	91·87	21·0
(6) 7th August, 1912 ..	5·12*	1·28	89·6	22·4

* Now under crop.

From this stand-point alone, fallowing is more than justified, but when we realize that, in addition, we get a sweeter condition of soil, further quantities of phosphoric acid, and potash rendered available, and a better seed bed, also the admission of larger proportions of the rainfall, and later on greater supplies of moisture, a fallow becomes almost imperative, and is practically a first rate commercial proposition. Even a couple of months' fallow is better than none, but the earlier the fallow the greater the return.

As the seeding season approaches, the land should be well worked with a cultivator and harrows to get a fine tilth, as such a condition is very important for maize. The first working should be deep and successive workings shallower, in this way a firm consolidated seed bed is formed, and the lumps are brought to the surface. Every working assists in making more of the plant foods available, and in keeping the weeds and insect pests down. As the season advances, the surface should be kept loose with the harrows to prevent evaporation. On loose friable soils no second ploughing will be necessary if the above directions are followed; but on stiffer soils liable to run together it is sometimes necessary to plough again shortly before seeding. Where this is the case, shallow ploughing in the spring, say 4 inches, is best, after which the land can be worked down fairly fine again. Maize and all other crops like a fine firm solid seed bed. The roots are very fine, and get a larger surface-feeding area under such conditions and a healthier state of affairs exists. Open spaces under the surface tend to produce root rot and other troubles, and also prevent the circulation of moisture, through which means all the foods are taken by the crop in a state of solution.

Where the land breaks up lumpy roll first and cultivate afterwards. The roller embeds and cracks the lumps, which then break up more readily with cultivators. If a soil is naturally too friable and open, then heavy rolling to consolidate it is desirable, but the surface should be loosened afterwards with the harrow to prevent loss of moisture.

It is not wise to work a soil down to a dusty fine state, especially a clay loam, as it is liable to set with rain and form a crust, preventing the admission of air and rain, causing evaporation and consequent coldness and loss of moisture, and reducing at the same time the beneficial effects due to oxidation and nitrification.

(*To be continued.*)

THE WALNUT.

(Continued from page 153.)

C. F. Cole, Orchard Supervisor.

INTERPOLLINATION.

Successful nut production depends upon the simultaneous presence of the two kinds of flowers, staminate (male) and pistillate (female), either upon the same tree, or others growing in close proximity, or at a distance where the transferring or supplying of pollen to the pistillate (female) flower by aid of insects or other external agents can be accomplished. Very little of a specific nature can be written upon this subject as to the distance the pollen of the walnut from staminate flowers upon the one tree may influence the pistillate bloom upon another. For practical purposes, where interpollination is required, planting the trees in close proximity to one another should be carried out.

It is no uncommon thing to see walnut trees producing each year catkins (staminate bloom) in abundance and practically no pistillate (female) blooms, also trees producing pistillate and no staminate blooms. Many walnut trees during the early stages of growth have a tendency to produce female blooms alone, but, as they grow older, eventually produce catkins (male blooms) in sufficient quantity. Enough has been written upon the necessity of selecting a variety, or varieties, for planting out. To be of any commercial value, the tree should yield both staminate and pistillate blooms, particularly the latter, in quantity. The planting of a grove with different varieties that bloom partially or completely at or about the same time is a wise precaution. The interchange of pollen from one variety to another is probably beneficial, if not at times essential, particularly if the staminate blooms should happen to be sterile upon any one variety during any particular season, a thing that may probably occur.

FERTILIZATION.

In Victoria, outside of the application of farmyard manure and a limited quantity of chemical manure, such as bonedust and superphosphate, applied to the young trees at the time of planting, the writer is not aware of any manurial experiments which have been carried out upon scientific and practical lines. The experiments carried out in California upon sound lines do not justify any special recommendations. The trees receiving heavy dressings of stable manure and nitrogenous materials seem to have benefited most. With regard to the trees responding to chemical manures and increasing the yield of nuts, no direct results were obtained. There is little doubt that the practice of using certain manures, combined with thorough cultivation, will ultimately be of the greatest value, especially to old trees and those approaching the age of maturity. Manures containing nitrogen and phosphoric acid—the most-needed elements in almost any plant—produce and maintain improved growth and vigor.

An extract from *Le Noyer et sa Culture*, by F. Peneveyre, of Lousanne, Switzerland.—The author quotes M. Rouault, Departmental Professor of Agriculture for the Department Isère, France, who bases his calculations on the amount of plant-food removed. He continues, "One can thus decide the dose of each manure element to employ for the production of 100 kilos (220 lbs.) of walnuts. The following formula, established on this basis, may be applied to each tree:—

5.3 kilos (11.6 lbs.) nitrate of soda.
0.95 kilos (2.1 lbs.) superphosphate.
0.42 kilos (.924 lbs.) muriated potash.

For practical purposes the following quantities when applying the manure will be as follows:—

11 lbs. 10 ozs. nitrate of soda.
2 lbs. 2 ozs. superphosphate.
15 ozs. muriated potash.

This formula to be varied according to the age of the tree, the abundance of the yield, and also the fertility of the land.

Mixed manuring, with farmyard and chemical manures, which supplies humus rich in nitrogen, and slowly assimilates, certainly produces good results, and permits the reduction of the above quantities, especially of nitrate of soda.

The manure should be spread on the soil in November (May in Australia), or, at any rate, in winter. It should be ploughed in, the depth of such ploughing depending on the nature of the land and the size of the trees." As already stated, the physical conditions of the soil, and the supply of moisture, are of more importance than the chemical composition. Good cultivation is of far more importance for the first few years from planting than using fertilizers and not cultivating. The sowing of field peas is of value. The peas should be sown as soon as the crop is gathered, and ploughed under when in bloom. If necessary in the drier districts, and irrigation is available, the soil should receive a watering, and be well worked up before sowing the peas.

HARVESTING.

The first indications given that the nuts have reached maturity and the time to harvest is at hand is by the husk or outer covering beginning to burst. When the husk opens sufficiently, the nut usually falls to the ground (plate 28). The freedom in which the husks cast the nuts is controlled largely by the conditions of the husks at the time of maturity. In dry localities or dry seasons, particularly if the trees have suffered from the want of soil moisture, the nuts do not leave the husks so readily. Sunburn or injury to the husk during the development of the nut will prevent shedding, the husk adhering to the stone. Cool atmospheric conditions or a fall of rain during the bursting period will greatly accelerate the casting of the nuts. The regularity of nut-casting varies somewhat with different varieties and individual

Plate 28.—Matured Walnuts, about to be cast. Bursting of the husks.

trees. Some trees cast the majority of their nuts within a short while from maturity, others taking a longer period. The usual practice, and one to be recommended, is to shake the trees. To accomplish this, several methods are to be seen in vogue. Permanently attaching fencing wire to the branches, allowing sufficient length to hang down so that the wire can be reached and pulled by standing upon the ground, the wire being loosely fastened around the branch to prevent cutting it through expansion of growth; the using of long poles with stout hooks fastened to the ends, so that the boughs can be shaken without causing injury to the trees; climbing the trees and shaking the boughs with the hands; the ancient custom of thrashing the tree with long poles.

(*To be continued.*)

NOTE ON THE COST OF HARVESTING LUCERNE HAY.

The fourth cutting of lucerne hay at the Central Research Farm, Werribee, for the present season was made on 8th, 9th, and 10th February. The time occupied by men and horses in mowing, raking, pitching, carting, and stacking the hay for this cut was carefully recorded, and consequently the cost of each operation can be calculated from the data thus obtained. In reckoning the cost of the operations some arbitrary figure for the cost of a horse had to be allowed. This may be taken at 2s. 6d. per horse per day, which covers cost of feeding, attention, and maintenance in normal seasons. This figure is, of course, much less than a contractor would expect to receive for contract work, but it is as much as a farmer would debit his crops with in estimating the actual cost of team work done on the farm.

The area of the lucerne field is 50 acres, but of this 9.83 acres were cut for daily green feed for the dairy herd, and is not included in the area under review. The balance—40.17 acres—was cut for hay and yielded 45.27 tons of commercial lucerne hay, containing 85 per cent. of dry matter, or an average cut of 22¼ cwt. per acre over the whole area.

The wages of farm labour is reckoned at 7s. per day—the actual cost. The following table, showing the segregation of wages and horses on the various items was supplied by Mr. H. MacDermid, Officer in Charge of Records, Werribee:—

TABLE I.

SUMMARY OF COST OF HARVESTING 40.17 ACRES LUCERNE AS LUCERNE HAY.

Hours Worked.	Cost of Horses.	Cost of Mowing.	Cost of Raking.	Cost of Pitching.	Cost of Stacking.	Cost of Carting.	Cost.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
287½ ..	4 8 10	2 5 4	2 6 10	2 12 4	1 4 8	2 6 5	15 4 5

	£	s.	d.
Total cost for harvesting 40.17 acres	15	4	5
Cost per acre	0	7	7
Cost per ton	0	6	3¼

The following table shows the analysis of the expenditure:—

TABLE II.

ANALYSIS OF EXPENDITURE INCURRED IN HARVESTING 40.17 ACRES LUCERNE.

	Hours.	Total Cost.		Cost Per Acre.	Cost Per Ton.
		£ s. d.	£ s. d.		
Mowing—					
Cost of labour	65½	2 5 4			
Cost of horses, at 2s. 6d. ..	..	1 15 3		s. d.	s. d.
			4 0 7	2 0	1 8*
Raking—					
Cost of labour	53	2 6 10			
Cost of horses	..	1 1 1			
			3 7 11	1 8	1 5*
Pitching—					
Cost of labour	72½		2 12 4	1 4	1 1
Stacking—					
Cost of labour	33½		1 4 8	0 7½	0 6
Carting—					
Cost of labour	6	2 6 5			
Cost of horses	..	1 12 6			
			3 18 11	1 11½	1 7½
	287½		15 4 5	7 7	6 3½

* Calculated on dry weight, not on weight of green crop.

With an average cut of lucerne equal to 1 ton per acre, the cost per ton and the cost per acre would, of course, be identical. From the above table, it will be seen that the cost of the various operations per acre was as follows:—

	s. d.
Mowing	2 0
Raking	1 8
Pitching	1 4
Stacking	0 7½
Carting	1 11½
Total cost	7 7 per acre.

The figures per ton for mowing and raking are of course calculated on the basis of dry hay. The real cost per ton of cutting and raking the green lucerne would be only about one-third of the above cost, since the lucerne at the time of cutting contains thrice the tonnage of the cured lucerne hay.—A.E.V.R.

GREEN MANURING EXPERIMENTS.

Field trials and laboratory experiments were made with a green manure obtained from crops of "Crotalaria juncea" (Sann hemp) in Pusa soil. The general result of the field trials was that no advantage accrued to the succeeding crop from the previous green manuring.

In the laboratory experiments the optimum moisture content of the soil for nitrification was 18 per cent., *i.e.*, with the soil three-eighths saturated; under this condition 67.8 per cent. of the nitrogen of the manure was nitrified in eight weeks. The optimum depth for burial varied with the age of the plant, and also with the aeration and moisture of the soil, the more mature plant requiring to be buried nearer the surface. The biological activity of the soil was tested by the amount of carbon dioxide formed per day; the addition of the green manure increased the carbon dioxide about ten times, and the addition of a fertilizer such as superphosphate or bone meal to the green manure still further increased the evolution.

Indications were obtained that the first stages of decay of the green manure were brought about mainly by fungi.—C. M. Hutchinson and S. Milligan, Agricultural Research Institute, Pusa, India. *Bulletin No.* 40, 1914.

The distance travelled to plough 1 acre can be reckoned from the width of the furrow. At 6 inches wide it would be necessary to travel 16½ miles.

In 1911 there was 1 acre under crop for every 14 acres in Victoria. In Tasmania the proportion was 1 acre to 58; in New South Wales 1 to 59; in South Australia 1 to 89; in Queensland 1 to 643; and in Western Australia 1 to 730.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

Monthly Report, Ending 14th March, 1915.

The past month was again noteworthy for the wide range of temperatures between the hours of 6 a.m. and 6 p.m. The highest for the month was 109 deg. in the fowl-houses, at 2.30 p.m. on 15th February; the lowest was 46 deg., at 6.30 a.m. on 24th February.

The birds have done well generally, and their health was good. The past month was noted for the birds being free from sickness of any kind. The moult is now very heavy, and, of course, egg yield suffers in consequence.

The rainfall for the month was 45 points.

A. HART,
Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914-1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition.			Position in Competition.
			15th April to 14th Feb.	15th Feb. to 14th Mar.	Total to date—11 months.	
		LIGHT BREEDS.				
		WET MASH.				
36	White Leghorns ..	E. A. Lawson	1,434	107	1,541	1
25	,, ..	*J. H. Gill*	1,437	96	1,533	2
26	,, ..	Mrs. H. Stevenson ..	1,376	129	1,505	3
10	,, ..	R. Hay	1,318	112	1,430	4
9	,, ..	J. J. West	1,303	115	1,418	5
16	,, ..	A. R. Simon	1,315	100	1,415	6
17	,, ..	F. Doldissen	1,282	112	1,394	7
11	,, ..	C. J. Jackson	1,273	116	1,389	8
19	,, ..	Marville Poultry Farm ..	1,272	115	1,387	9
33	,, ..	W. G. Osburne	1,263	109	1,372	10
40	,, ..	J. Schwabb	1,249	123	1,372	
37	,, ..	S. Brown	1,242	104	1,346	12
45	,, ..	H. C. Brock	1,247	95	1,342	13
4	,, ..	Giddy and Son	1,264	76	1,340	14
29	,, ..	V. Little	1,224	105	1,329	15
23	,, ..	S. Buscumb	1,213	114	1,327	16
8	,, ..	F. W. Brine	1,172	124	1,296	17
20	,, ..	A. W. Hall	1,160	127	1,287	18
15	,, ..	E. Waldon	1,176	107	1,283	19
35	,, ..	W. Tatterson	1,194	88	1,282	20
1	,, ..	F. G. O'Bree	1,182	100	1,282	
22	,, ..	B. Mitchell	1,156	123	1,279	22
30	,, ..	W. G. Robbins	1,164	115	1,279	
47	,, ..	W. G. Swift	1,167	107	1,274	24
14	,, ..	F. C. Western	1,122	121	1,243	25
44	,, ..	A. Ross	1,157	63	1,220	26
6	,, ..	C. R. Jones	1,105	111	1,216	27
43	,, ..	Bennett and Chapman ..	1,121	86	1,207	28
12	,, ..	A. H. Mould	1,099	98	1,197	29
2	,, ..	J. C. Armstrong ..	1,114	80	1,194	30
38	,, ..	G. Hayman	1,104	87	1,191	31
3	,, ..	T. A. Pettigrove ..	1,083	107	1,190	32
24	,, ..	C. Pyke	1,113	75	1,188	33
28	,, ..	Utility Poultry Farm ..	1,120	64	1,184	34
34	,, ..	W. A. Rennie	1,105	71	1,176	35
32	,, ..	Gleadell Bros.	1,079	98	1,177	36
18	,, ..	All-lay Poultry Yards ..	1,075	97	1,172	37
41	,, ..	Doncaster Poultry Farm ..	1,071	95	1,166	38
5	,, ..	A. Mowatt	1,053	111	1,164	39
13	,, ..	H. Hanbury	1,065	93	1,158	40
42	,, ..	E. W. Hippe	1,074	62	1,136	41
43	,, ..	G. Mayberry	1,018	117	1,135	42
31	,, ..	E. H. Bridge	1,047	63	1,110	43
39	,, ..	R. L. Appleford ..	1,005	101	1,106	44
21	,, ..	R. A. Lewis	988	105	1,093	45
49	,, ..	A. Beer	953	97	1,050	46
50	,, ..	F. G. Silbereisen ..	946	95	1,041	47
7	,, ..	B. Cohen	910	105	1,015	48
46	,, ..	C. L. Sharman	898	97	995	49
27	,, ..	Walter M. Bayles ..	890	93	983	50
		Total	57,398	5,011	62,409	

Fourth Victorian Egg-laying Competition, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Feb.	15th Feb. to 14th Mar.	Total to date—11 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		Dry Mash.				
60	White Leghorns ..	W. N. O'Mullane ..	1,460	133	1,593	1
55	,, ..	E. A. Lawson	1,382	70	1,452	2
51	,, ..	Moritz Bros.	1,235	104	1,339	3
61	,, ..	H. Hanbury	1,199	107	1,306	4
53	,, ..	C. Lawson	1,208	93	1,301	5
65	,, ..	W. G. Osburne	1,203	60	1,263	6
58	,, ..	Miss L. Stewart	1,162	56	1,218	7
59	,, ..	F. G. Silbereisen ..	1,102	99	1,201	8
62	,, ..	A. Greenhalgh	1,089	94	1,183	9
68	,, ..	E. W. Hippe	1,099	82	1,181	10
63	,, ..	Hanslow Bros.	1,091	90	1,181	
69	,, ..	C. J. Beatty	1,036	107	1,143	12
70	,, ..	W. H. Robbins	1,045	95	1,140	13
52	,, ..	Myola Poultry Farm ..	1,055	69	1,124	14
64	,, ..	E. A. Carne	1,035	85	1,120	15
57	,, ..	J. Jackson	1,008	102	1,110	16
54	,, ..	G. Carter	1,024	74	1,098	17
67	,, ..	Walter M. Bayles ..	1,013	77	1,090	18
66	,, ..	S. Brown	741	66	807	19
		Total	21,187	1,663	22,850	
		HEAVY BREEDS.				
		Wet Mash.				
77	Black Orpingtons ..	J. McAllan	1,331	120	1,451	1
71	,, ..	J. Ogden	1,220	102	1,322	2
88	,, ..	H. H. Pump	1,198	93	1,291	3
89	,, ..	Marville Poultry Farm ..	1,187	91	1,278	4
87	,, ..	A. Douglas	1,095	108	1,203	5
84	Rhode Island Reds	J. Mulgrove	1,116	79	1,195	6
81	Black Orpingtons ..	D. Fisher	1,094	97	1,191	7
76	,, ..	W. P. Eckermann ..	1,084	80	1,164	8
82	,, ..	J. H. Wright	1,075	68	1,143	9
75	,, ..	Fairdeal Poultry Farm ..	1,043	81	1,124	10
73	,, ..	J. A. McKinnon ..	1,019	95	1,114	11
72	,, ..	T. W. Coto	1,003	108	1,111	12
74	,, ..	S. Brown	1,001	85	1,086	13
83	,, ..	Cowan Bros.	890	57	947	14
85	Golden Wyandottes	J. C. Mickleburgh ..	765	90	855	15
78	Red Sussex ..	Jorgen Anderson ..	746	59	805	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	718	53	771	17
86	Buff Wyandottes ..	W. G. Swift	535	55	590	18
		Total	18,120	1,521	19,641	
		Dry Mash.				
100	Black Orpingtons ..	D. Fisher	1,053	67	1,120	1
97	,, ..	J. McAllan	989	112	1,101	2
90	,, ..	J. H. Wright	1,022	65	1,087	3
98	,, ..	A. Greenhalgh	1,003	75	1,078	4
91	,, ..	C. E. Graham	912	88	1,000	5
96	Rhode Island Reds	Myola Poultry Farm ..	894	85	979	6
94	Black Orpingtons ..	T. W. Coto	905	58	963	7
92	,, ..	Fairdeal Poultry Farm ..	865	60	925	8
93	,, ..	Myola Poultry Farm ..	820	60	880	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	724	61	785	10
95	,, ..	C. L. Hewitt	469	54	523	11
		Total	9,656	785	10,441	

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ORCHARD AND GARDEN NOTES.

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The Orchard.

Pests and Diseases.—All secondhand and odd cases should be thoroughly overhauled. It is preferable to do this now, instead of leaving it till spring, when the rush of duties will certainly prevent such work being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with red oil emulsion for woolly aphis, peach aphis, and the bryobia mite (red spider): and this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

Vegetable Garden.

Vegetable Garden.—There should now be no untidy or undug plots in the kitchen garden. The vacant beds should be well dug over and prepared for the planting of vegetables for use in spring. In digging a top dressing of manure should be given: this may be dug in. All weeds, too, may be forked into trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

A few early peas, also some broad beans, may now be sown. Cabbage, cauliflower, and other seedlings should be planted out from the seed beds. All garden salads and herbs, such as thyme, mint, horseradish, sage, &c., as well as rhubarb, should be divided and planted out where necessary.

Onion seeds for any early crop may be planted out towards the end of the month. Brown Spanish is very hard to beat as an all-round onion, while the new variety of Early Brown Spanish may be relied upon to produce an early crop.

Flower Garden.

The removal of permanent shrubs and palms, and the planting out of evergreen trees, shrubs, and herbaceous divisions should not be delayed any longer. The nursery section of this class should be cleared out into the garden at once. It is a mistake to wait, as many growers do, for the removal of such plants until the winter season. If planted out now while the ground is warm, the roots of the plants have a fair chance to grow, to take a considerable hold of the soil, and to establish

themselves in their new location before the growth period ceases. Then, after the winter's rest, they are ready to break away into new growth, both in the roots and crown, with the advent of the first spring weather. When planted in winter, they have no chance to grow, the roots remain as when planted, and with every chance to rot in the cold wet soil, the foliage becomes yellow and debilitated, and the plant, if it does not succumb, often takes the whole ensuing season to recover its general health. And then, of course, the season that has been lost can never be regained.

Gardens should now be well drained or trenched. This is a feature more often overlooked than otherwise. And yet no garden can produce the results it should produce unless one or both of these very necessary operations are carried out. There is a wealth of plant food and food supplies below the usual digging depth, and gardeners should never neglect to dig down deeply, so that the roots of their plants may have an increased area in which to travel for food and moisture. Deep working is an absolute essential in every garden. It means a saving of water and manures for the grower, and it also means increased growth, health, and blossoms for the plants. The ground should always be well dug to the full depth of the soil once a year, and an occasional stirring of the subsoil is also invaluable. A mistake often made is that the clay is brought to the surface, and the top soil buried beneath it. Nature's order should never be reversed, and the relationships of top soil, and then subsoil, should always be recognised. After the autumn digging, the ground may be left in a fairly rough state, as the usual climatic conditions will result in a gradual weathering down of the surface. The autumnal dressing of lime is always beneficial.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs, as these pests have a very great liking for such succulent growths. A good surface dressing of broken leaf or dust tobacco will effectively deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust form, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy, and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinums, aquilegia, coreopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

REMINDERS FOR MAY.

LIVE STOCK.

HORSES.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should

be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Attend to teeth and feet of horses to be turned out for the winter.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

PIGS.—As recommended in Reminders for April.

SHEEP.—Attend to lambing ewes early every morning, particularly if merinoes lambing to rams of larger breeds. Comeback and first-cross ewes usually commence lambing about now. When crutching for fly, also clear round the udders of all well-wooled ewes; this enables many lambs to live through stormy nights that would otherwise die. Allow sufficient feed in lambing paddocks; hungry ewes are always bad mothers. Prepare inferior fleeced ewes for sale as fats, also any ill-shaped and old ewes; mutton will be greatly in demand from now on. Prize all good fleeced, shapely young ewes of all breeds; these are sure to be of extreme value for years. Do not leave lamb-marking late. In fine weather, ram lambs, when only a few days old, can be castrated, whenever and wherever they can be caught. No assistant is necessary to hold them.

POULTRY.—Feed animal food to forward pullets, about ½ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily. See that fowl houses are free from draughts to avoid colds, also that they are free from red mites. Use Epsom salts freely to avoid Roup and Chicken Pox.

CULTIVATION.

FARM.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans. Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

ORCHARD.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

FLOWER GARDEN.—*Digging, manuring, and pruning; trench and drain where* necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

VEGETABLE GARDEN.—Cut down and clean out asparagus beds. Apply manure *and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes;* sow peas, broad beans, carrots, and parsnips.

VINEYARD.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as is practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves, which continues so long as the leaves remain green. Sheep should not be allowed into the vineyard until all leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., *for green manuring, should be sown without delay, in order* to take advantage of early rains. Applications for grafted resistant rootlings for 1915 must be made before end of May.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should *also be racked and fortified to full strength.*